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The Orchadian

Official Journal of the Australasian Native Orchid Society Inc.

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Thelymitra macrophylla on rock. Photo Harry Ashton

The Orchadian

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Editorial

The Orchadian readership is very diverse, ranging from new to experienced orchid growers and career scientists. The content needs to reflect this broad range of interest so that over time everyone finds articles that are relevant and stimulating. This is a considerable challenge that is difficult to meet and depends to a large extent on the nature of contributions made to the journal. The scope of the journal does not include highly technical contributions, and orchid classification is only occasionally covered, as it can become difficult to understand. In this issue Katharina Nargar and Heidi Zimmer offer an introduction to evolutionary studies that contribute to classification, written in clear language without many technical terms. These studies involve the use of molecular markers to form phylogenetic trees that have branches with various levels of statistical support. It is a complex field, and even when markers have strong support, this does not automatically imply that those branches automatically correspond to genera or other ranks. Different markers can be in conflict due to hybridisation, incomplete lineage and other factors, which means that it can be difficult to be sure that a tree reflects the true phylogeny, that is, the sequence of evolution.

This approach to classification, along with other approaches, including traditional morphology, is here to stay and can be followed further by using online references and information. Decisions are made on the basis of available published evidence, considered by suitably qualified and experienced people, rather than on opinions and the decisions can be consulted in various listings. ANOS Inc., after consideration by ANOS Council many years ago, like many other orchid organisations, follows the World Checklist of Selected Plant Families (WCSPF) or Plants Of the World Online (POWO).

Classification is always evolving as new information becomes available. An announcement of the Orchid Taxonomy Advisory Group

Australasia (OTAGA) which will endeavour to look at various options for Australian orchid groups is made by Heidi Zimmer, Katharina Nargar and Anthony Whalen.

Matthew Renner examines and reflects upon *Sarcochilus falcatus*, the type species for *Sarcochilus*, its considerable variation along a very long distribution north to south in eastern Australia, and influence on hybrids. Michael Coker has an approach to culture of *Sarcochilus* that may be unique in that he adopts techniques to produce peak flowering for a particular show scheduled two months earlier than most *Sarcochilus* shows.

The Macarthur ANOS Group has commenced a very interesting and potentially useful project to survey orchids in the Macarthur region. Ross Morrison and Jim Cootes outline the features of the project and we look forward to their ongoing findings in the future. ANOS Western Australia has been active between 2019 and 2021, with meetings, excursions, participation in shows and welcoming 16 new members. It is very heartening to receive a report of such successes and I hope there will soon be similar ones from other groups.

Peter B. Adams

ANOS Groups and Societies

Current contact details can be found at **anos.org.au** or in the individual group website.

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ANOS Townsville Inc.
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ANOS New Zealand Native Orchid Group

President's Report

There are limited ANOS Inc. group activities from December to March so there is not much to report unless you grow the majority of the *Dendrobium* sect. *Spatulata* or some of the *Sarcochilus* species or hybrids, those with a dominance of *S. australis*, *S. hirticalcar* and *S. ceciliae* parentage to name a few. Due to the proximity to Christmas, New Year and Australia Day, there are normally no monthly meetings or shows to exhibit orchids during this period.

It was pleasing to read in the December 2021 issue of *The Orchadian* about the virtual show held by the ANOS Newcastle Group. Under COVID-19 lockdown conditions, the groups have had to become inventive in holding virtual shows as competitions of "benched" plants. Necessity is the mother of invention. I do not consider that anything can top the atmosphere of a show, however, when you cannot hold face to exhibit shows then something like a virtual show is a good substitute. I am hopeful that shows will return to normal in 2022. It would be interesting to hear from other groups about their experiences with virtual events.

I am concerned that attendance and benching of plants at group monthly meetings and shows may take a hit when these events return. It was a bit of a shock when all events ceased suddenly in March 2020. Some members have become accustomed to not going to group meetings and shows, and groups may have to find methods to encourage members back. The groups do not just consist of the main office bearers, the management committee or the growers that take out most of the prizes. Groups are the entire membership. It is the camaraderie, extensive knowledge, and the passing on of this knowledge that is the backbone of a group. Members new to orchids ask the best questions and I find that these questions make me think the most. I avoid answering with "that is the way it has always been done". Questions make me ask why it is done that way and is there a simpler or better way.

I encourage members, when they feel safe to do so, to attend group meetings and shows to rediscover the pleasures and rewards of these activities.

We send our best wishes to members who may have been badly affected by the recent major flooding along the east coast of Australia, from the Mary River, Queensland in the north to large areas of eastern New South Wales. Some of the extraordinary rainfall fell over the peak of the Great Dividing Range and resulted in floodwaters moving to the west and having serious effects on more communities. If you have been affected by flooding then I wish you a speedy clean up and replacement/repair of the flood damage, and hope that your treasured orchids did not get washed away and recover quickly from any inundation.

David James

How Evolutionary Studies Inform Genus-level Classification in Orchids

Katharina Nargar[1] and Heidi Zimmer[2]

[1]Australian Tropical Herbarium & National Research Collections Australia (CSIRO), James Cook University, GPO Box 6811, Cairns, QLD 4878, Australia. Katharina.Nargar@csiro.au

[2]Centre for Australian National Biodiversity Research (a joint venture between Parks Australia and CSIRO), GPO Box 1700, Canberra ACT 2601, Australia. Heidi.Zimmer@csiro.au

Over the past two decades, there have been many proposed changes in genus-level classification for Australasian orchids, which has led to confusion and inconsistency in application of orchid names (Hopper 2009). These changes have consisted either of broadening a genus concept to incorporate other, closely related genera, or narrowing taxonomic concepts which has led to the splitting of previously more broadly defined genera into several smaller genera.

To understand some of the reasons why orchid names change and why there is a controversy around which names to apply, we first need to look at what the science of biosystematics endeavours to achieve: to ensure that the classification of organisms into categories, such as in genera and families, is founded on evolutionary relationships. The reason for this is that well-founded, scientifically rigorous classifications allow predictions about the properties and traits of organisms, and this is an important requirement for many other branches of biology, both pure and applied (Taxonomy Decadal Plan Working Group 2018).

In practice, biosystematists study organisms to find evidence for evolutionary relationships to assess whether changes in classifications are required. Traditionally, this was largely based on morphological characters, and every technological leap brought new characters to consider, e.g., anatomical, micro-morphological, and phytochemical, and with these, new insights into evolutionary relationships were gained. With the advent of DNA sequencing technologies, it became possible to study evolutionary relationships based on comparison of DNA sequences, as DNA is universally present in all organisms. Mutations through evolutionary time result in differences in DNA sequences, which can then be used to group organisms according to the similarities in their DNA and thus to arrive at well-founded hypotheses about evolutionary relationships. DNA data therefore provides an additional line of evidence, which complements our scientific toolkit, to understand evolutionary relationships. DNA-based research can help clarify issues that may arise through interpretation of traditional data, e.g., in instances in which organisms arrive at a similar morphology due to similar environmental pressures.

Now, it is important to know that different DNA studies are not equally robust and that early DNA studies in particular had two main shortcomings which affected the reliability of the results: 1) The DNA regions studied were often only one or few, resulting in a very low statistical sample of an organism's genetic diversity as a whole. This is similar to investigating only one plant part (e.g., the leaf) in a morphological study as opposed to many (habit, leaves, inflorescence, flowers, fruits, etc.). To tell us whether the relationships shown in an evolutionary tree are reliable, different statistics are available. These statistical values are

shown for each evolutionary relationship shown in the tree and indicate how much trust we can have in each. The statistical values are very important to consider, and inform scientists if they need to expand their datasets. In the case of early DNA studies, these often received poor statistical support values. 2) As DNA sequencing was laborious and expensive in the early days, many studies only included a few species to represent a taxonomic group and thus studies often did not consider morphological outliers or lacked the type species of a genus (the species on which the taxonomic concept for the genus is founded). Over the past two decades, DNA sequencing technology has vastly improved, enabling cost- and time-efficient sequencing of many more regions of the genome and for many more samples, thus addressing the shortfalls of early DNA studies.

How Can Evolutionary Studies Tell Us If We Got Our Classification Right or Wrong?

One main principle that biosystematics aims to address is that a taxonomic category, say a genus or other rank, comprises all descendants of the last common ancestor for that group. If you imagine a tree, a taxonomic group should always comprise all branches, twigs and tips that are held by a larger branch or twig. Below are three scenarios with examples to illustrate possible outcomes of biosystematic studies. In these examples, we assume that all relationships shown are statistically well supported. In reality, statistical support usually varies across evolutionary trees, which needs to be taken into account when interpreting the relationships shown.

Scenario 1: It turns out that members of a genus sit on two or more branches of an evolutionary tree which cannot be connected along the branches without including species of other genera. Such a case mandates taxonomic adjustments as the current classification does not represent evolutionary relationships correctly.

An example for scenario 1 is the case of the New

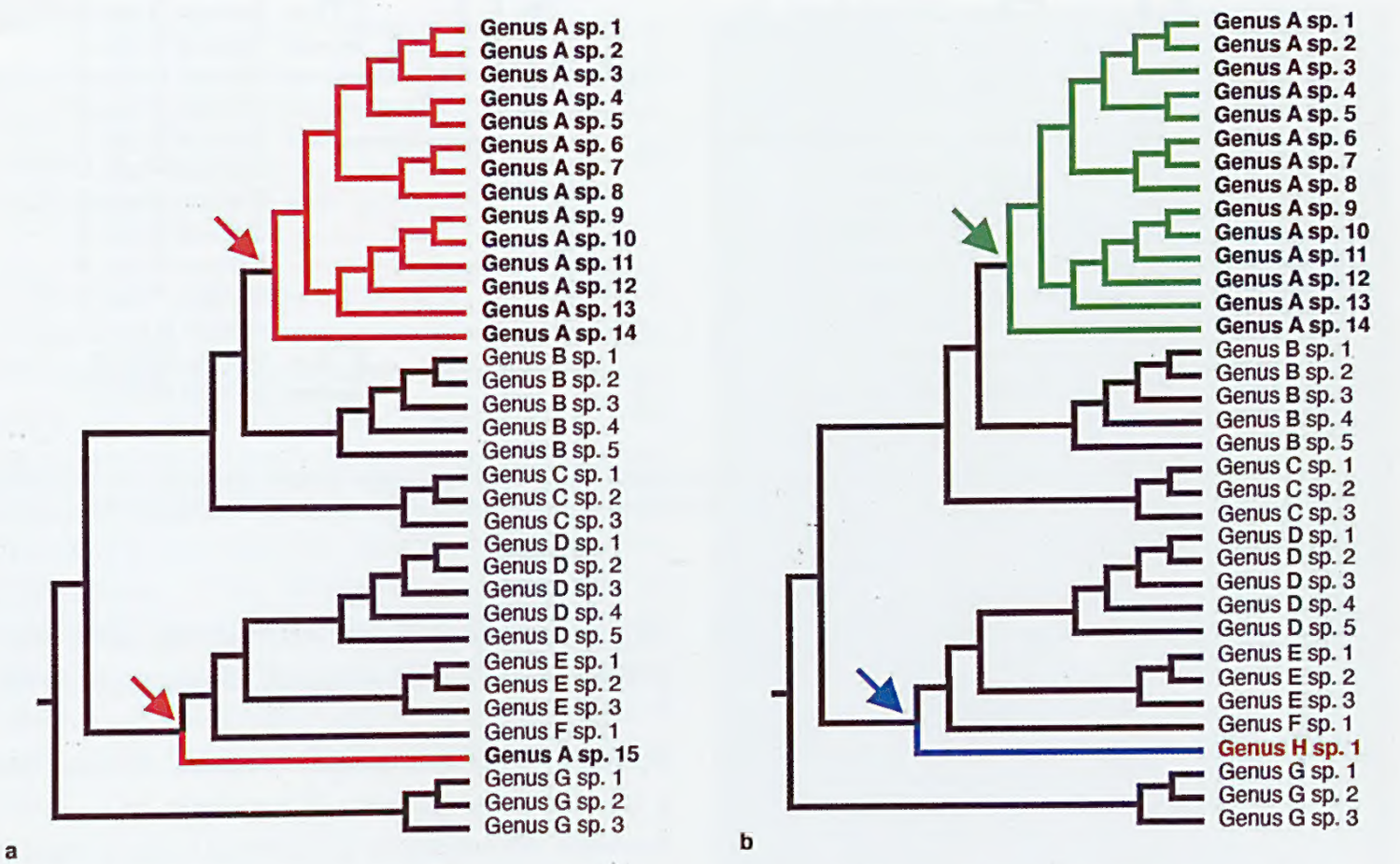


Fig. 1. Evolutionary trees illustrating scenario 1. a) Tree showing the evolutionary relationships between species of seven genera (A-G). Species that are included in genus A are in red. Because 'species 15' is not part of the branch which unifies all other species of genus A, the circumscription of genus A requires adjustments. b) Tree showing a solution for this taxonomic issue, in this case by placing the aberrant species in a separate genus (genus H, in blue), while genus A remains otherwise intact (in green).

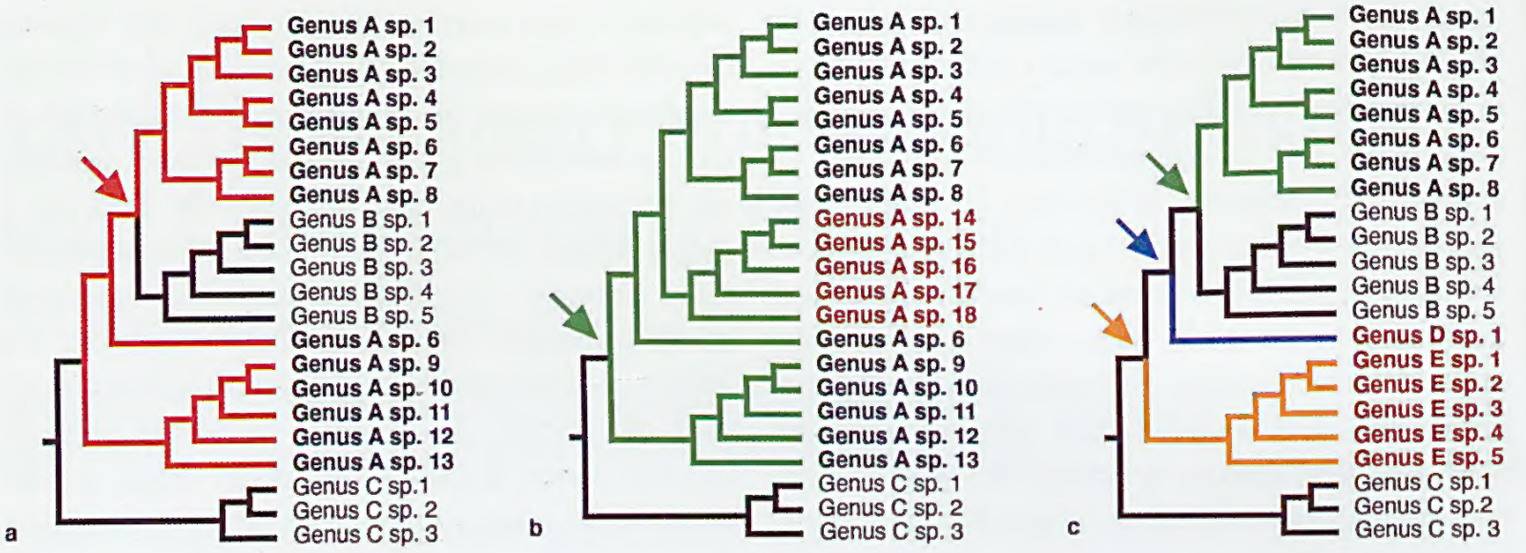


Fig. 2. Evolutionary trees illustrating scenario 2. a) Tree showing that genus A (in red) is not unified by a common branch without inclusion of genus B. b) Tree showing a possible solution to this issue by sinking genus B into genus A (a broadened genus A in green). c) Tree showing an alternative solution to the taxonomic issue by splitting genus A by placing some of the species into genus D (in blue) and genus E (in yellow).

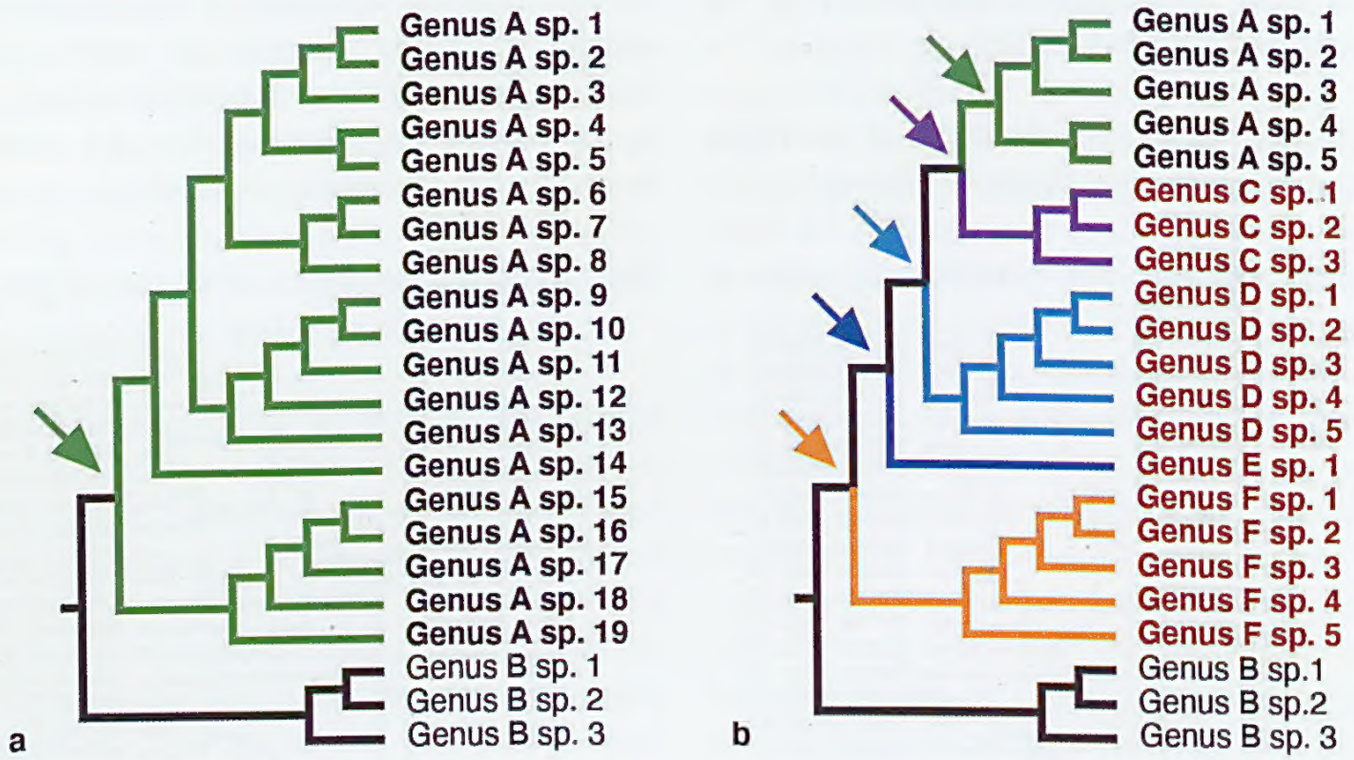


Fig. 3. Evolutionary trees illustrating scenario 3. a) Tree shows that genus A is unified by a single branch, supporting the taxonomic concept of genus A. b) Genus A is split into several new or resurrected genera to accommodate the different evolutionary lineages that were found within genus A and recognise these at genus level.

Caledonian orchid formerly known as *Megastylis glandulosa* (see photo). DNA studies revealed that this species was not closely related to other species in the genus *Megastylis* (which is part of subtribe Diurideae) but was found within another main branch of the Orchid Tree of Life (in subtribe Cranichideae), where it sat on a branch by itself (Clements et al. 2002). The taxonomic concept for *Megastylis* was adjusted by transferring *Megastylis glandulosa* to a new genus, *Achlydosa*, which is now widely accepted (Chase et al. 2015).

Scenario 2: Evolutionary research reveals that a branch encompasses all members of a genus, however all members of another closely related genus are also part of the same main branch, and there is no way to subdivide the main branch to trace all members of each genus back to their own

Megastylis gigas. Photo M. Clements.

separate branch. Again, this mandates taxonomic adjustments, however there are two principal ways to go about this: broadening of the generic concept or narrowing it. Usually, there are several valid options on how this can be achieved.

A prominent example of this type of taxonomic conundrum is the genus *Dendrobium* (see photo). DNA studies revealed that several smaller genera (such as *Dockrillia* and *Flickingeria*) were positioned amid *Dendrobium*. To solve this issue, both approaches shown in Fig. 2 were proposed: broadening the taxonomic concept of *Dendrobium* (Schuiteman 2011; Pridgeon et al. 2014) or narrowing the concept by accommodating the remaining species in new or resurrected genera which each sit on their own branch (Clements & Jones 2002; Clements 2006).

Scenario 3: The results clearly show that all members of a genus sit on the same branch of the evolutionary tree with no other orchid species from other genera being part of that branch.

Achlydosa glandulosa. Photo M. Clements.

Dendrobium moniliforme. Photo M. Clements.

Dendrobium scopa. Photo M. Clements.

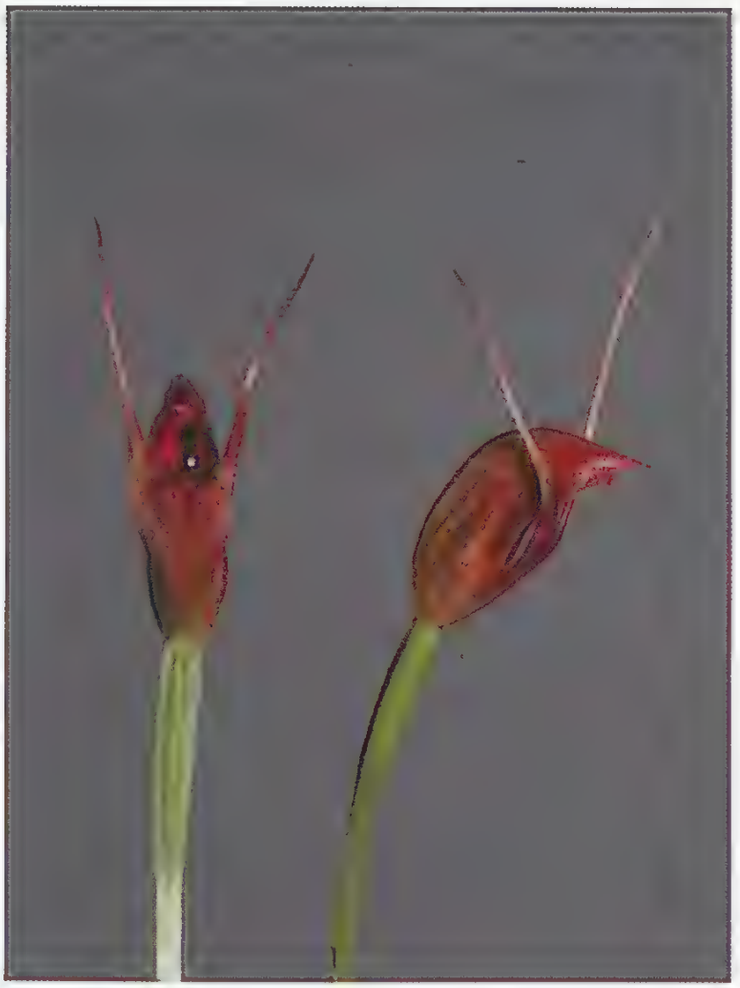
Dendrobium rigidum. Photo A. Lim.

This supports the taxonomic concept, and no action is required. However, the DNA results have also revealed some structure within the concept, indicating there are groupings within the current taxonomic concept which could be recognised; taxonomic change for these groups is optional. When weighing up the pros and cons for alternative taxonomic concepts, other features which enable recognition of these groups, such as morphology, are considered.

Examples for DNA studies which have confirmed previous taxonomic concepts for Australian orchid genera are *Thelymitra*, the sun orchids (Nauheimer et al. 2018) and *Calochilus*, the beard orchids (Nargar et al. 2018).

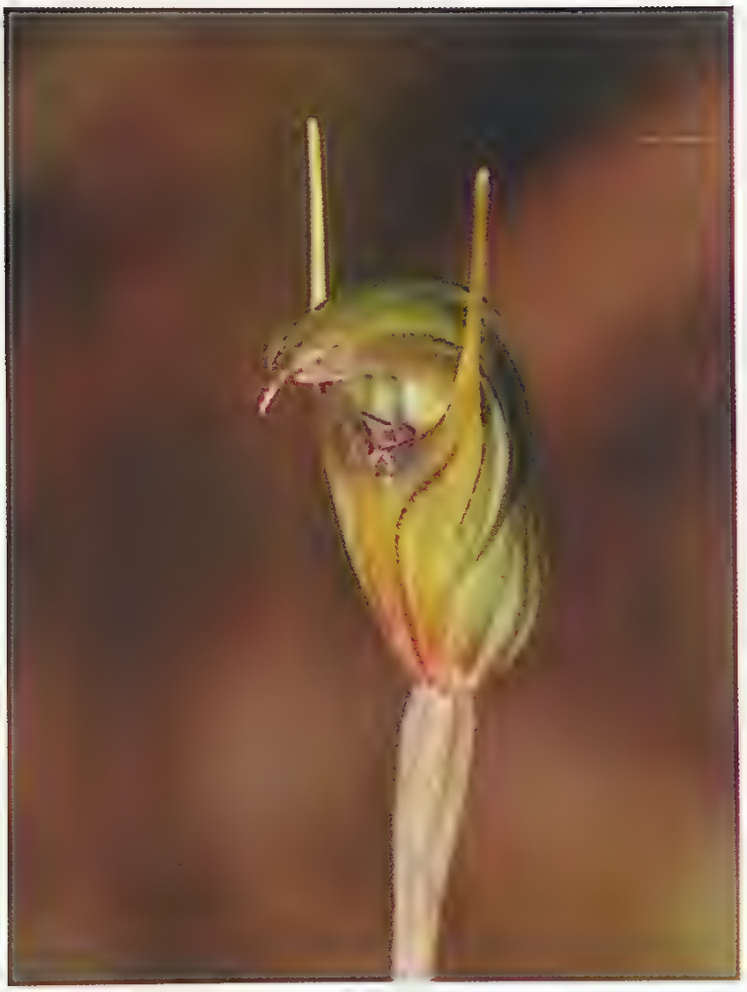
DNA research often also reveals more fine-scaled evolutionary relationships which manifest as subbranches in the evolutionary trees. Species on these subbranches may share more similarities with each other than to species of the other subbranches (e.g., in their morphology and ecology). This result still does not mandate taxonomic adjustments. However, it is technically possible to subdivide the group into smaller genera, which then are taxonomically valid (Turland et al. 2018). However, the use of the resulting taxonomically valid names is often rejected by the taxonomic community because an additional guiding principle, that of taxonomic stability, is not accounted for.

A prominent example for the third scenario is the genus *Pterostylis* (see photos), for which the evolutionary tree comprises several subbranches which consist of morphologically distinct subgroups (Jones and Clements 2002, Clements et al. 2011). This led to alternative taxonomic concepts recognising up to 15 genera, such as *Oligochaetochilus, Diplodium,* and *Speculantha* (Jones and Clements 2002, Clements et al. 2011), whereas other studies advocated for maintaining the broader concept of *Pterostylis* in favour of taxonomic stability, and to recognise evolutionary lineages within *Pterostylis* at taxonomic ranks



Pterostylis erecta. Photo M. Clements.

Pterostylis rufa. Photo M. Clements.



Pterostylis concinna. Photo M. Clements.

below genus level (as subgenera and sections) (Janes et al. 2010; Janes and Duretto 2010).

Scenarios 2 and 3 lead to most controversies in proposals for taxonomic name changes for Australasian orchids. At the heart of these lies the tension between two endeavours: ensuring that taxonomic names keep up with 'more profound knowledge of the facts resulting from taxonomic studies' (Turland et al. 2018) and avoiding unnecessary name changes in favour of taxonomic stability. The latter is an important guiding principle as taxonomic changes can devalue the currency of previous literature, databases, or plant collections that use the earlier taxonomic concepts. As names are the key with which we access other biological information for the group (e.g., regarding number of species in a genus, its morphological features, its distribution and ecology), unnecessary name changes risk breaking the link to knowledge about the organisms. Therefore, taxonomists endeavour to carefully consider which of the options results in the least amount of change to avoid potential confusion and potential disruption of the associated metadata, while at the same time being firmly based on robust scientific evidence. These considerations will take different lines of evidence into account, including morphological, anatomical, ecological, and where available, DNA-based research. Morphological characters will continue to play a key role in recognising biological diversity and therefore, alternative classifications are evaluated on grounds of observable traits which characterise the different groups. Here, evolutionary trees based on DNA data can help us re-evaluate traits which have been used in classification to discern among groups, and help us to assess the utility of these traits to recognise these groups. Where there are alternative solutions to classification, our ability to recognise these groups is a paramount criterion in decision-making.

As shown here, the evaluation of taxonomically, alternative generic concepts in Australasian orchids has many complexities. The consensus achieved by orchid systematists and taxonomists, e.g., based on publications such as *Genera Orchidacearum* (Pridgeon et. al. 2014), was adapted by major online databases, such as World Checklist of Selected Plant Families (WCSPF), Plants Of the World Online (POWO) and the World Flora Online (formerly The Plant List), as well as by many botanical societies such as the Royal Horticultural Society and the American Orchid Society. When taxonomic revision results in the proposal of name changes, these are considered by expert groups and decisions are made to either adopt or reject the proposed concepts. This consultative process is an important mechanism to keep botanical classification consistent and up to date.

The Orchid Taxonomy Advisory Group Australasia (OTAGA) has been established with the aim to further the work of a consensus view on genus names for Australasian orchids based on all available scientific evidence (see Zimmer et al., this volume).

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Introducing the Orchid Taxonomy Advisory Group Australasia (OTAGA)

Heidi Zimmer[1,2], Katharina Nargar[3] and Anthony Whalen[1,2]

[1,2] Centre for Australian National Biodiversity Research (a joint venture between Parks Australia and CSIRO), GPO Box 1700, Canberra ACT 2601. Heidi.Zimmer@csiro.au

[2]Department of Agriculture, Water and the Environment (AWE), GPO Box 858, Canberra ACT 2601, Australia. Anthony.Whalen@awe.gov.au

[3]Australian Tropical Herbarium & National Research Collections Australia (CSIRO), James Cook University, GPO Box 6811, Cairns, QLD 4878, Australia. Katharina.Nargar@csiro.au

Abstract

Our understanding of relationships among species within the Orchidaceae continues to be refined. New understanding, particularly around evolutionary relationships, has provided impetus for change in orchid classification. For some species this has led to multiple name changes over a relatively short time, resulting in uncertainty around the names of some orchids. In recent years, a holistic approach (including genetics, genomics, morphology and biology) to understanding of evolutionary relationships has led to consistent conclusions for relationships within many subtribes and genera. To review this research the Orchid Taxonomy Advisory Group Australasia (OTAGA) has been established. It is composed of members from botanical institutions from around Australia, as well as New Zealand, New Caledonia and the Royal Botanic Gardens in Kew. It will provide expert recommendations to the Council Heads of Australasian Herbaria for consideration, who in turn will make their taxonomic decisions as part of the standard Australian Plant Census process.

Background

The Orchidaceae has suffered from instability in taxon circumscription and naming for some time because of its size and complexity (Chase et al. 2015); its many young, and actively evolving lineages (e.g., Wagner et al. 2021); hybridisation (e.g., Nauheimer et al. 2018); self-pollination and bottleneck effects (e.g., Lehnebach et al. 2005, Swarts et al. 2009). With increases in our understanding of orchids and their evolutionary relationships have come changes to taxonomic concepts and names, in some cases with multiple changes in a relatively short time (Hopper 2009) – discussed in more detail by Nargar and Zimmer (this issue).

There is uncertainty about taxon circumscription and accepted names for many orchid taxa in Australia. This creates challenges for those who work with orchids including enthusiasts, land managers, and government policy makers. It is a particular problem for synthesis of orchid data across jurisdictions (states and territories, and internationally), creating a frustrating hurdle in communication and collaboration. This problem has been highlighted with the development of large-scale biodiversity databases (e.g., Atlas of Living Australia, Australasian Virtual Herbarium), where problems with data harmonisation can occur due to differing taxonomic concepts and associated nomenclature. The usefulness of these

Figure 1. Example of subtribe Caladeniinae - *Caladenia fuscata* (Rchb.f.) M.A.Clem. & D.L.Jones. Photo H. Zimmer

databases, which often supply the data that drive conservation prioritisation and action, is reliant on a strong taxonomic backbone.

A holistic approach to researching and understanding orchid molecular systematics and taxonomy has now yielded considerable evidence to inform our understanding of evolutionary relationships of many orchid subtribes and genera. Many studies (i.e., genetic, genomic, morphological, and biological) have been consistent in their conclusions.

OTAGA

It was in this context that the idea for the Orchid Taxonomy Advisory Group Australasia (OTAGA) was formed. Could we create a group to provide advice on generic concepts for selected Australasian orchid subtribes where there are currently multiple taxonomies in use, based on a review of the scientific evidence?

We brought the idea of OTAGA to the Council of Heads of Australasian Herbaria (CHAH). CHAH is composed of members from the major Australian and New Zealand herbaria and aims promote all matters of interest to herbaria in Australasia and to increase cooperation and understanding between herbaria. CHAH was supportive of OTAGA and emphasised that the recommendations of OTAGA should be viewed as an 'expert recommendation' for consideration by CHAH institutional representatives, who in turn will make their taxonomic decisions as part of the standard Australian Plant Census process (APC). APC is the established source for agreed plant names in Australia as endorsed through consensus by CHAH. For more information see https://www.anbg.gov.au/chah/apc/about-APC.html.

Through CHAH we asked for nominations from the various herbaria for OTAGA participants, to contribute critical discussion about orchid taxonomic concepts at generic rank, and the systematics research (in particular molecular

Figure 2. Example of subtribe Drakaeineae - *Caleana major* R.Br. Photo Z. Groeneveld

Figure 3. Example of subtribe Acianthinae - *Corybas dowlingii* D.L.Jones. Photo H. Zimmer

systematic data) which supports these concepts. To ensure an Australasian viewpoint, we also invited members from botanical institutions in New Zealand, New Caledonia and the Royal Botanic Gardens Kew.

Next Steps

OTAGA had its establishment meeting in September 2021. The group currently has 14 members, including: chair, Gill Brown from Queensland Herbarium; keynote speaker, Katharina Nargar from Australian Tropical Herbarium; coordinator, Heidi Zimmer from the Centre for Australian National Biodiversity Research; and observer, Anthony Whalen, Australian Biological Resources Study manager. The broad representation within OTAGA will help ensure an inclusive process, maximise the breadth of expertise, and ensure discussions are broad and conducted with an awareness of global issues, including recent research advances, and implications of expert group recommendations. In this way we hope that the expert group recommendations may be adopted more broadly.

The OTAGA scientific meetings, to occur over the coming six months, will focus on five subtribes: Acianthinae, Caladeniinae, Drakaeinae, Prasophyllinae, and Pterostylidinae (Figs. 1–5). A report on OTAGA discussions and recommendations will be presented to CHAH for future APC consideration. We are optimistic that having an expert group dedicated to review of taxonomic concepts in these subtribes will lead to recommendations which in turn will lead to a more cohesive understanding of Australia's orchid diversity and increased consistency in the application of Australasian orchids taxonomic names needed for effective management and conservation.

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Figure 4. Example of subtribe Prasophyllinae - *Microtis unifolia* (G. Forst.) Rchb.f. Photo H. Zimmer

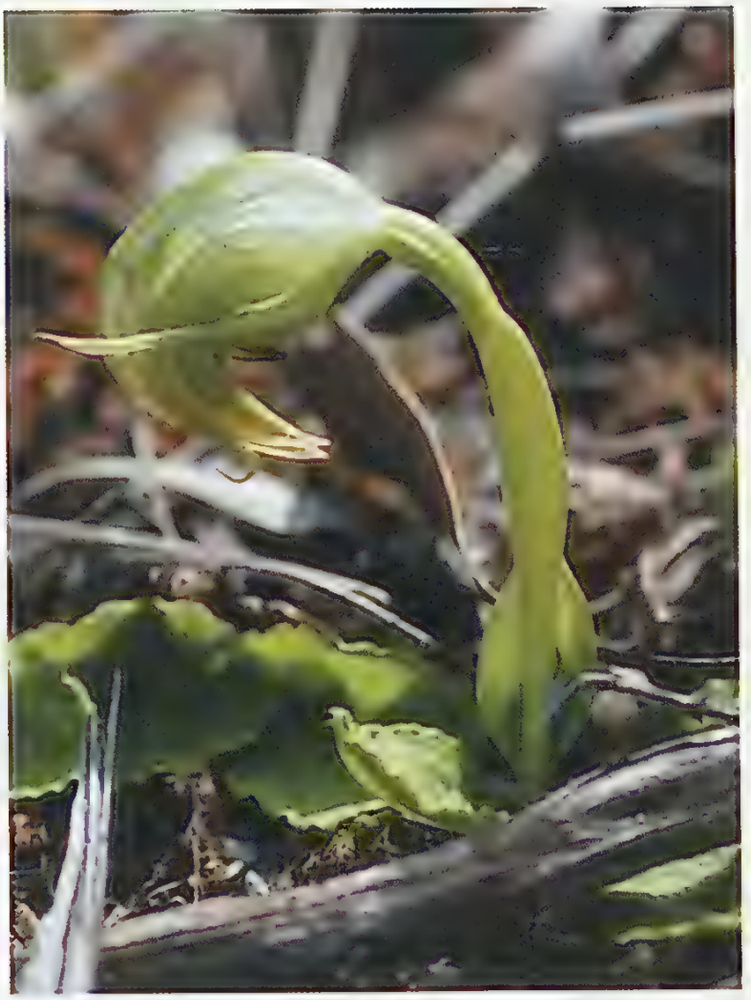

Figure 5. Example of subtribe Pterostylidinae - *Pterostylis nutans* R.Br. Photo M. Clements

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Sarcochilus falcatus and Its Influence on *Sarcochilus* Hybridization

Text and photos by Matt A.M. Renner | matthewamrenner@icloud.com

Summary

Sarcochilus falcatus presents opportunities and challenges to growers, hybridizers, and judges in its range of variation in size, shape, and colouration. This article briefly reviews variation within the species, approaches to award quality judging, and the influence *S. falcatus* has had on hybridizing to date.

Introduction

Most Australians are familiar with the king orchid or rock lily, the pink rock orchid, sun orchids, spider orchids, the dagger orchid, and the orange-blossom orchid, *Sarcochilus falcatus* R.Br. (Fig. 1). *Sarcochilus falcatus* gets its common name from the form and scent of its flowers, which supposedly bear a superficial resemblance to those of citrus.

At least three factors contribute to our familiarity with *Sarcochilus falcatus*. The first is that it is widespread and occurs in three states, including eastern Victoria, along and east of the Great Dividing Range of New South Wales to the Border Ranges, and southeast Queensland, and has populations at Kroombit Tops, and in the Wet Tropics Bioregion of northeast Queensland (Fig. 2). The second is the flowering habit, in particular the production of relatively large, close-set, white flowers on multiple racemes per lead, which generally offer a conspicuous contrast to the green foliage and background shade associated with their rainforest habitat. Thirdly is the frequent occurrence in high-light environments including forest edges, and alongside tracks, roads, or carparks.

Sarcochilus falcatus may be a common epiphyte in some forest types, such as warm-temperate rainforests and *Nothofagus* forests in the Border Ranges, where visitors during late August and September will see flowering plants at eye-level and above on a variety of host tree species. *Sarcochilus falcatus* also grows in other forest types, including those with *Acacia melanoxylon*, which may be a favoured host in some situations.

The wide distribution and relative conspicuousness of *Sarcochilus falcatus*, undoubtedly contributed to it being the first *Sarcochilus* species described, by the Scottish botanist Robert Brown (1773–1858), who collected specimens on the banks of the Paterson and Williams Rivers on the north side of the Hunter Valley during the circumnavigation of the Australian Continent by HMS *Investigator* under Captain Matthew Flinders. Brown held the position of naturalist to that expedition, on which he collected more than 3500 species of plants from all around Australia, some 2000 of which were new to science. Brown published the results of his botanical explorations in the *Prodromus Flora Novae Hollandiae* (Brown 1810), in which were described new many genera characteristic of Australia that we still accept today, including *Telopea, Grevillea, Isopogon, Petrophile, Eremophila, Caladenia, Pterostylis,* and *Sarcochilus*. Brown's description of *Sarcochilus falcatus* is brief but precise, describing the five equal, spreading tepals, and the postical labellum with a fleshy medial lobe, among other details (Fig. 3).

In concert with its wide distribution, *Sarcochilus falcatus* exhibits variation in floral morphology in terms of size, shape, and colouration. Among the many forms, three 'variants' are usually

Figure 1. *Sarcochilus falcatus* flowering plant, Border Ranges, New South Wales.

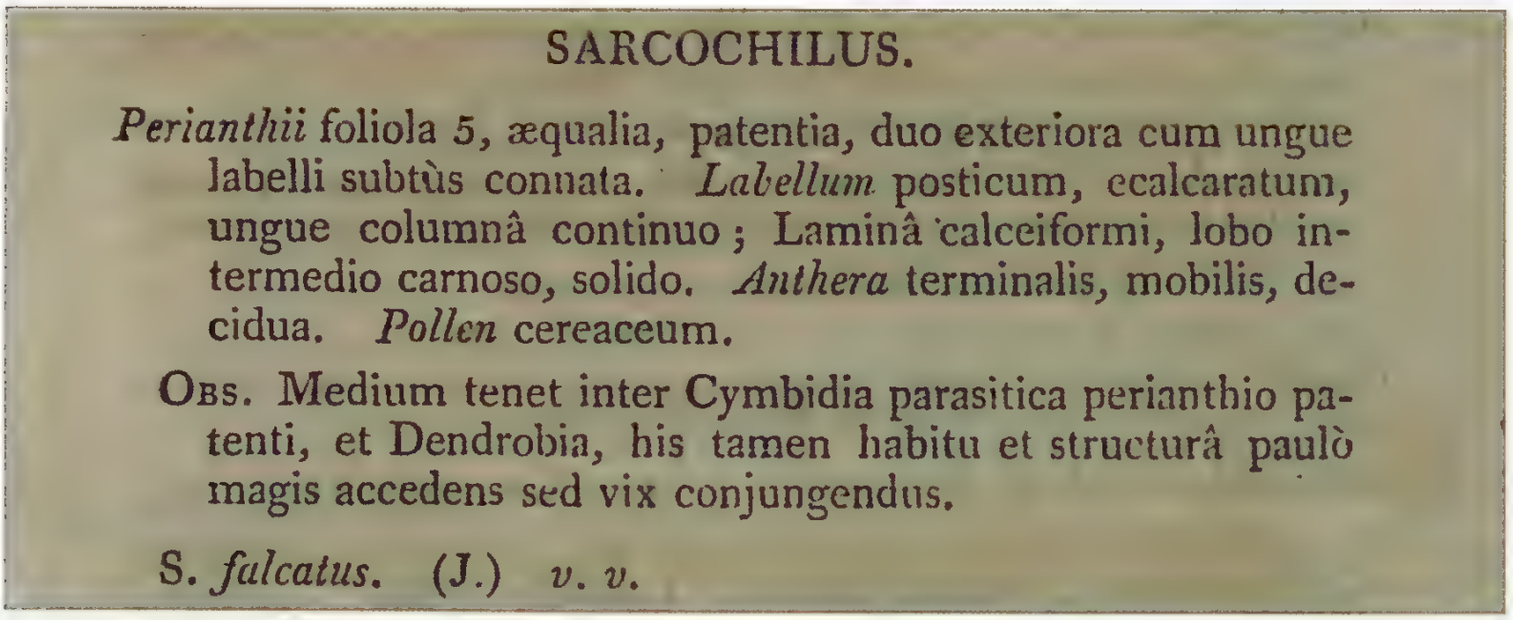
Figure 2. Distribution of *Sarcochilus falcatus* based on herbarium specimens held by Australasian herbaria. Data and image from the Australasian Virtual Herbarium (2020).

recognized. Firstly, there is the standard *S. falcatus*, which has medium- to large-sized white flowers, whose segments are relatively broad, and the flowers may be relatively filled in, with red and yellow labellum markings and red-brown markings on the outer surface of the sepals or not (Fig. 1). Secondly, there is the 'purple-chinned' variant, characterized by vibrant purple markings on the forefoot of the labellum midlobe. Purple chins often also have striking markings on the column, and are generally smaller in flower size with narrower floral segments than typical *S. falcatus*, but not always. Although the segments may be smaller, the labellum seems approximately the same size as in 'standard' plants, so looks larger and more prominent within the context of an overall smaller flower. Interestingly the labellum lateral lobes may be taller and wider than in typical plants. Thirdly there are the 'large white' forms that have, as their name suggests, larger petals and sepals than average and less red pigmentation on their labellum and column. In these plants, the labellum looks correspondingly smaller within the context of the flower due to the segments being larger.

Some of these large white forms have been separated as a distinct species, *S. niveus* D.L.Jones & D.P.Banks, because of their larger flowers, slightly later flowering time, flowers mostly without red pigmentation, and without purple-brown pigments on the outside of the segments, and leaves that break rather than bend when pressed back toward the leaf base.

Variation Within *Sarcochilus falcatus*

The observation that *Sarcochilus falcatus* is variable raises the interesting question of whether or not *Sarcochilus falcatus* is more variable than other *Sarcochilus* species in flower morphology. There are several ways to approach the quantification of floral morphology, but for this project, I sampled photographs from the internet to capture the range of variation. Most of these photographs do not have a scale, so it is not possible to use linear measurements to



SARCOCHILUS.

Perianthii foliola 5, æqualia, patentia, duo exteriora cum ungue labelli subtùs connata. *Labellum* posticum, ecalcaratum, ungue columnâ continuo; Laminâ calceiformi, lobo intermedio carnoso, solido. *Anthera* terminalis, mobilis, decidua. *Pollen* cereaceum.

Obs. Medium tenet inter Cymbidia parasitica perianthio patenti, et Dendrobia, his tamen habitu et structurâ paulò magis accedens sed vix conjungendus.

S. *falcatus*. (J.) *v. v.*

Figure 3. The protologue of *Sarcochilus falcatus* in *Prodromus Flora Novae Hollandiae*. This short description achieved simultaneous publication of both species and genus, as *Sarcochilus* was monotypic at the time of first description (see Turland et al. 2019). Image from Biodiversity Heritage Library (2020) from content uploaded by the Missouri Botanical Garden.

quantify size. However, we can quantify some aspects of shape by estimating ratios that are then comparable across the image set. So, as an initial and admittedly somewhat crude estimate of flower shape variation, I calculated ratios of lateral lobe to midlobe width and lateral lobe to midlobe height (Fig. 5) for 22 *S. falcatus* individuals. This set of individuals includes the three variants, standard white, large white, and small purple-chinned, and others not fitting neatly into either, for example, small white forms that are similar to the purple chins, but without the purple chin, and large white forms similar to the big whites but with more red pigmentation on the labellum.

To calibrate an assessment of variation within *Sarcochilus falcatus* we need a point of comparison, so I measured the same ratios for 16 *S. hartmannii* flowers, again from images available on the web. A plot of these two ratios with red, pink and brown points representing the 22 *S. falcatus*, and the blue points representing the 16 *S. hartmannii* is presented in Figure 6. We can see that while *S. hartmannii* forms a relatively tight cluster, indicating consistency in labellum shape, *S. falcatus* forms a much looser aggregation, suggesting that it is indeed more variable in labellum shape. The plot also reflects in data something our eyes perceive, which is that the labella of *S. falcatus* and *S. hartmannii* differ in shape because the two species form separate clusters, a feature we might expect of different species. The other two points are *S. australis* (in black) and *S. spathulatus* (in green) . The three colours for *S. falcatus* represent the three variants, red for standard whites, pinks the large whites, and brown the purple chins. Other interesting features of the plot are the intermixing of labellum ratios from the largest and smallest flowered *S. falcatus*, the purple chins and the big whites, and the lack of separation of those variants from standard white *S. falcatus*. So, in summary, *S. falcatus* has a different labellum shape and is more variable in labellum shape than, *S. hartmannii*. The data suggests that there is a continuum of labellum shape, without separation of purple chinned and big white morphs from standard white *S. falcatus*, even though the labella of some individuals may differ in shape from the standard whites. An interesting aspect of variation is that purple chins tend to be associated with smaller flowers having narrower petals and sepals. Why this relationship between labellum shape and flower size might exist is an open question. A qualitative appraisal suggests that the small-flowered *S. falcatus* are more different from the standard morph than the large white morphs are, and if one warrants species status the other does too. But do either? We don't have an answer yet because achieving a full understanding of variation requires detailed

study across the entire distribution.

ANOS Awards

Given that *Sarcochilus falcatus* is a rather variable species in terms of flower morphology, what do we consider award quality *S. falcatus*? This is a tricky question to answer because although *S. falcatus* is, along with *S. fitzgeraldii* and *S. hartmannii*, sometimes considered one of the three 'classic' shaped species, variation within *S. falcatus* encompasses both 'classic' and 'non-classic' shapes. We immediately have a decision to make, which is how we should judge the species. Should we give preference to awarding those approaching 'classic' shape, and judge all plants against that shape standard? Should we apply two different criteria for shape, depending on the shape presented by the plant being judged, or should we regard all *S. falcatus* as being 'non-classic' shape? Perhaps we can obtain some guidance from previous awards. Six quality and three cultural awards have been given by the Australasian Native Orchid Society (ANOS) to *S. falcatus*, the highest of which is an Award of Merit (AM), to a plant that had previously received a Highly Commended Certificate (HCC). All awards have been granted in New South Wales besides two that were granted at the 4th ANOS Conference by a combined panel.

Sarcochilus falcatus 'Sandra's Gem' HCC/ANOS 2009 (NSW) for example had impressive size, excellent presentation, with flowers evenly spaced, not too crowded, and orientated to the front, good substance, clear crystalline and glistening white, and even and regular shape and spacing, and plane margins to the floral segments. The plant was also unusual in having very little red on the labellum, meaning the yellow markings form central highlights that were a point of interest within the otherwise white flower.

Sarcochilus falcatus 'Big White #1' HCC/ANOS 2013 (NSW) AM/ANOS 2015 (NSW) likewise had good flower count, large flowers, and made an impressive display. In this plant, there was a slightly larger gap between the dorsal sepal and petals than between the petals and lateral sepals, but the petals spread horizontally, and the segments were evenly sized and shaped among flowers. Again, this plant had little red barring on the labellum, with yellow pigments forming the main colour highlight at the centre of the flower.

Sarcochilus falcatus 'Margaret' HCC/ANOS 2000 (4th ANOS Conf.) was a good all-rounder among awarded plants. It had an exceptional flower count for the plant size, with four inflorescences on what appeared to be a single fan, but perhaps there is another fan out of shot in the award photographs. The flowers were clear white, without blemish, and the petals and sepals are evenly sized and have consistent shape, with plane margins, within and among flowers. The petals and sepals were relatively broad, flaring widely from a narrow base such that there is some overlap and gap-closure between the lateral sepals and petals, as such the flowers were particularly full for a *S. falcatus*. The labellum markings were crisp, and a mix of red

Table 1. Recent awards to plants with *S.* Melba in their parentage.

Sarcochilus Hybrid	Award	% *S. falcatus*
S. George Colthup '2000'	AM/ANOS 2010 (NSW)	25%
S. Burgundy on Ice 'Classic'	AM/ANOS 2011 (NSW)	12.5%
S. Serenade 'Lots of white'	HCC/ANOS 2015 (NSW)	12.5%
S. Olive Nymph 'Wild Strawberries'	HCC/ANOS 2017 (Vic)	12.5%
S. Vista 'Jacksons'	AD/ANOS 2018 (NSW)	6.3%
S. Bessie 'Yunlan'	HCC/ANOS 2019 (NSW)	12.5%
S. Effie 'Ena'	HCC/ANOS 2019 (Vic)	12.5%

and yellow. From a distance , this combination of colour does tend to appear brownish, so to really appreciate how striking these markings are we have to get in close to the flowers.

Sarcochilus falcatus 'Jacki' HCC/ANOS 2000 (4th ANOS Conf.) had a lovely, rounded outline to the flower, and broad segments, and was again a very appealing plant that put on a floral display well worthy of its award.

Another recent quality award was to *Sarco falcatus* 'Cambalb' HCC/ANOS 2015 (NSW), an albinistic plant lacking red pigments entirely, and having yellow pigments confined to the labellum midlobe, a highly unusual and appealing colouration.

A cultural award was given to plants with the 'purple chin', which *Sarco falcatus* 'Judy' ACC/ANOS 2018 (NSW) expresses to advantage, however, no quality awards have yet been given to purple chin plants. *Sarcochilus falcatus* 'Selby's Selection' ACC/ANOS 2006 (NSW) was a plant with an unusual labellum morphology that was cultivated to a very high standard. The oldest cultural award went to another albinistic plant, *Sarcochilus falcatus* 'Cheryl' ACC/ANOS 1992 (NSW), the plant was again obviously cultivated to a high standard.

These awarded plants set precedents regarding what are award quality *S. falcatus*. So, what should we be looking for in *Sarcochilus falcatus*?

Assessing Quality in *Sarcochilus falcatus*

Shape

The judging handbook states (Provision 155) shape should be the 'optimum shape within its own species'. What do we consider the optimum shape for *S. falcatus*? Despite considerable variation in flower shape, *Sarcochilus falcatus* flowers always present with some gaps on either side of the flower, at least between the petals and dorsal sepal, so I would advocate regarding all *S. falcatus* as non-classic in shape. This is in contrast to *S. hartmannii*, which can have a gap between the two lateral sepals beneath the labellum on the flower midline. *Sarcochilus hartmannii* and its hybrids may have flowers with that gap, but because it occurs on the flower midline and is 'masked' to some extent by the labellum they are regarded as 'classic' in shape. This is not the case in *S. falcatus,* where there are always gaps on both sides of the flower. Segment shape should be consistent within and between flowers, and overall flower shape should be consistent across the plant. Exact shape may be less important than consistency and balance, given *Sarcochilus falcatus* may express non-standard or near-standard flower outline, shape, and in-filling.

Broad segments are advantageous, as they minimize gaps separating adjacent petals and sepals. Some plants have 'floppy ears' -- petals whose long axis is orientated below the horizontal, so they appear to droop. I think that this detracts from flower shape by making the flower appear slightly crowded below the horizontal mid-line. Other plants have segments whose upper or lower margin undulates, again this may detract from the overall shape, especially if it is more pronounced in some flowers than others.

Because the shape and relative stature of the labellum is particularly variable within *Sarcochilus falcatus* the labellum is a critical feature to consider when assessing shape. Smaller flowers often have a relatively larger labellum, which is then prominent and dominates the centre of the flower, making the striking labellum markings a dominant feature. In contrast, in plants with larger flowers, the labellum is relatively small and may be inconspicuous at the middle of the flower. We should also consider the whole flower when assessing shape, including the flower outline and symmetry, the degree of flower 'cuppiness', and balance between the labellum and other flower segments is important in species with non-classic and variable flowers. Perhaps some of the smaller and larger flowered forms are not as appealing in shape as standard *S. falcatus*, for the wide spaces

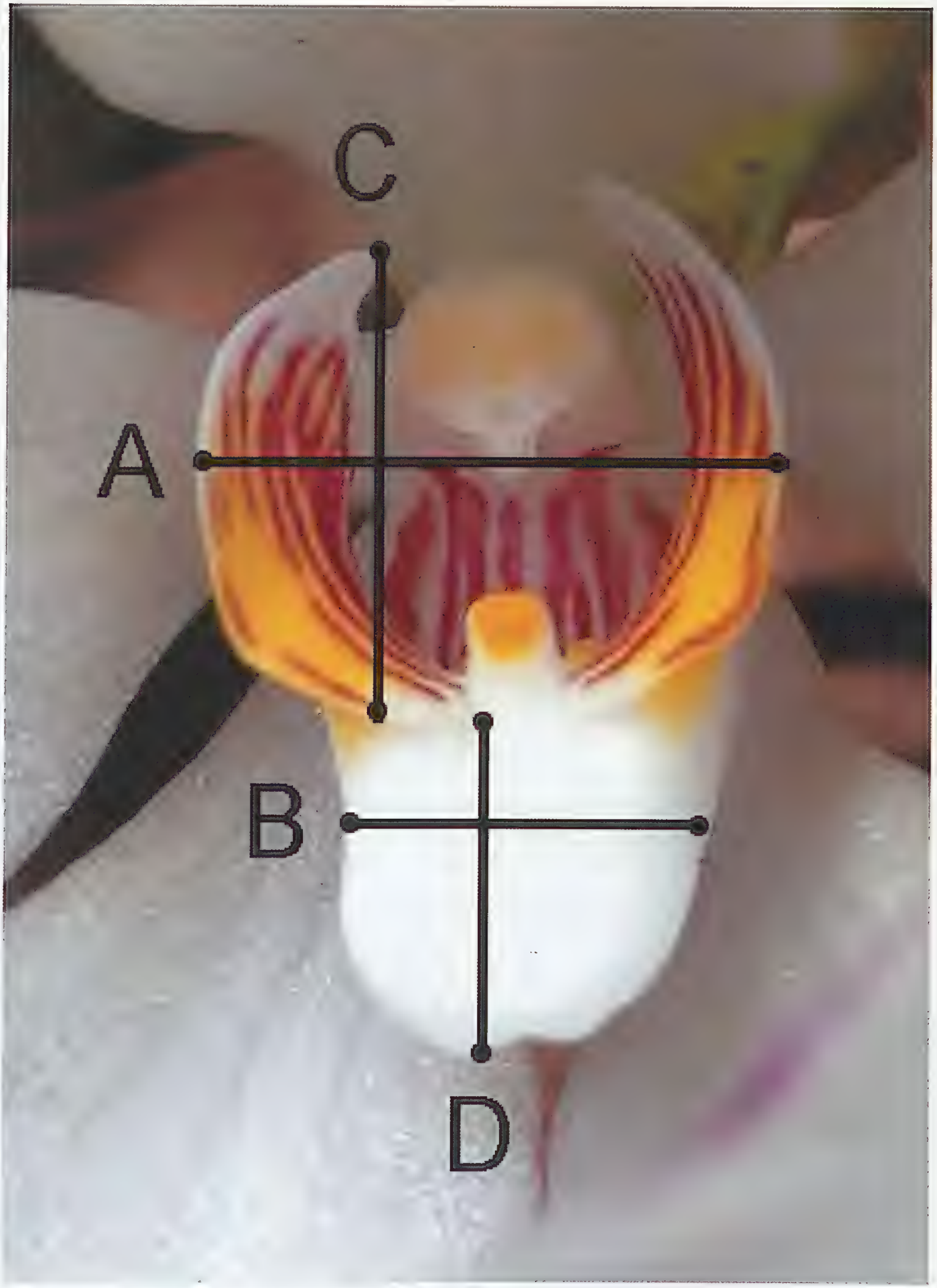


Figure 4. The dimensions measured to obtain ratios describing labellum shape. A: lateral lobe width. B: midlobe width. C: lateral lobe height. D: midlobe height.

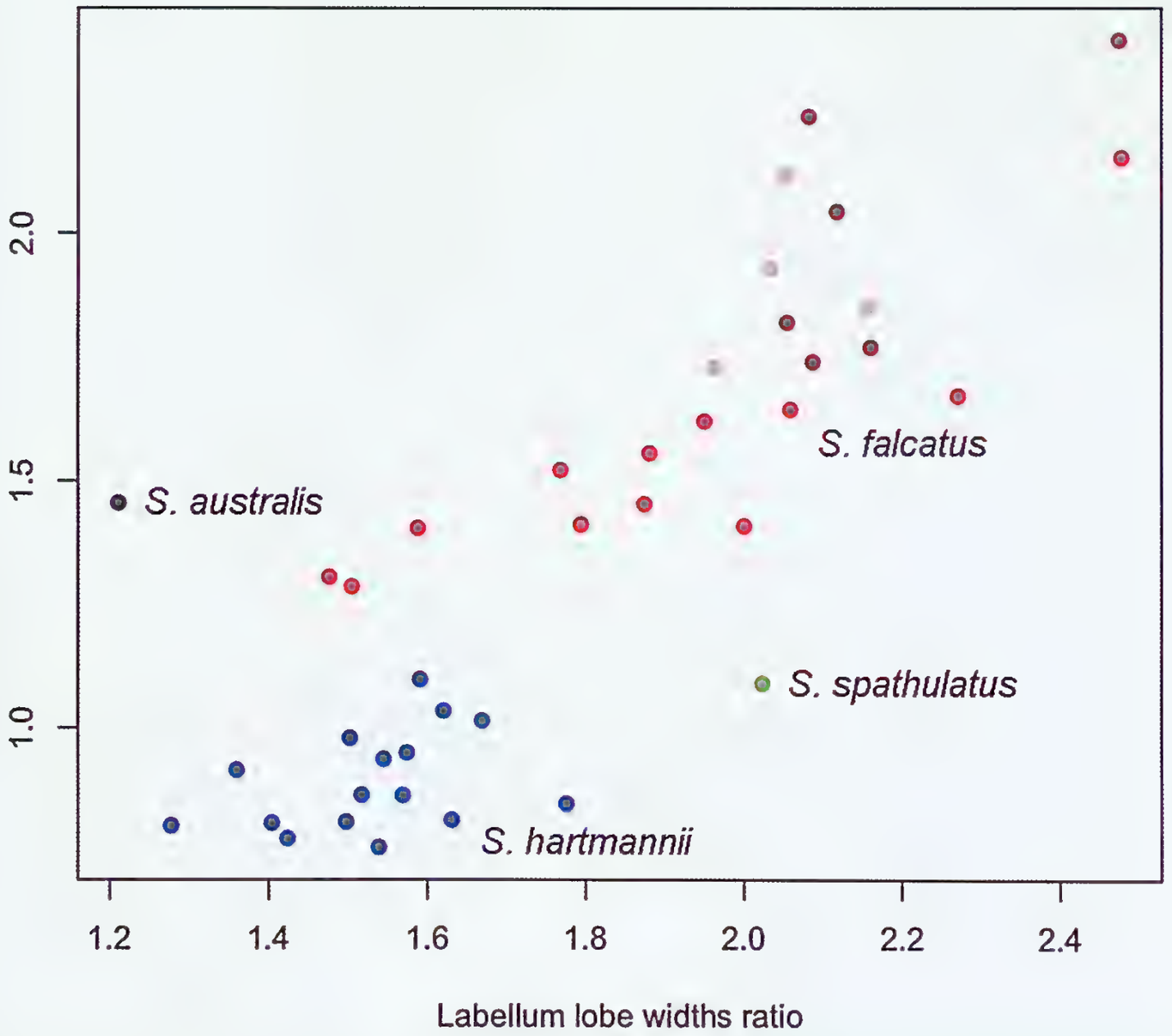


Figure 5. Ratio plot. The three colours for *S. falcatus* represent the three variants, red is for standard whites, pink is the large whites, and brown the purple chins. The other two points are *S. australis* (black) and *S. spathulatus* (green).

between segments on the one hand, and lack of balance between the segments and the labellum on the other. However, the wide range of variation presents the possibility that *multiple* shape optima may exist within *S. falcatus*. This is something that judging panels may consider when assessing outstanding individuals of variable species like *S. falcatus* against the precedent set by previously awarded plants.

Colour and Attractiveness

For white-flowered plants like *Sarcochilus. falcatus*, the flower has to be bright, clear, and clean. The white colour is due to the scattering and refraction of light through multiple tiers of overlapping cells, rather than the presence of a white pigment. The only pigments occur on the labellum, and fine detail of the labellum colour is also important. Labellum markings may be broken from the top to bottom of the lateral lobes, irregular, discontinuous and without well-defined margins, or may present as striking nearly continuous tiger-striping of warm red-brown stripes on a warm orange-yellow base. Some plants have gaps in the labellum barring, particularly at the front of the lateral lobes, these may or may not be regions where the underlying yellow pigmentation is more intense, others may express barring only in the lower half of the lateral

lobes. An even distribution of colour and pattern make for a more appealing display in my opinion, but others may have different points of view. Provision 156 of the Judging Handbook, which pertains to colour and attractiveness, states 'credit shall be given for unusual colours', and certainly there are unusual, or at least uncommon, colours in the production of purple pigments and the absences of red pigments, but we should be careful to not allow these appealing rare characteristics to outweigh other fundamental award quality attributes. We should be rewarding flower quality, rather than flower rarity.

Size

Size should be an optimum size for the species, where optimum is generally interpreted to be the largest. However, while 35 mm diameter is a big flower for *S. falcatus*, and I've seen some around that size in the Border Ranges, they are rather ungainly at this size, and loose in shape more than they gain in stature in my opinion. There may be a trade-off between size and shape in *S. falcatus*, and the largest flowers are not necessarily the best shaped. The judging standards require us to consider the size and shape separately so while large-flowered individuals might score highly for size, they may not score as highly for shape as smaller flowered plants.

Substance and Texture

These should be firm, lustrous, and without blemish, as per Provision 158 of the Judging Handbook. Substance does vary in *S. falcatus*, and larger flowers generally have more substance, but some of the best substances are in the standard whites.

Floriferousness

Higher flower count and multi- raceme habit are both advantageous attributes. Around 10 flowers per inflorescence and 3 or 4 inflorescences per growth seems to be optimal in cultivation, though Gerry Walsh reports seeing up to 14 flowers on an inflorescence. Wild plants I've seen produce anywhere between 3 and 8 flowers per inflorescence. With regards to flower opening, like many *Sarcochilus*, *S. falcatus* opens as flower buds mature, from the base to the apex of the inflorescence, but flower longevity is such that inflorescences may have all flowers fully opened.

Habit of Inflorescences

Good presentation of flowers requires even spacing and outward orientation, whether among or below the foliage. *Sarcochilus falcatus* flower racemes will generally arch forward and down and should display flowers to the front, where the light is coming from, presuming the plant is mounted on a slab. This might be a trick for growers – mount on a slab that is longer than the plant to ensure that the inflorescences are only lit from the front. Racemes that bend backward would be disadvantageous, and ones that crowd or project forward of others may detract from the overall display.

In summary, there are several points to consider when judging *Sarcochilus falcatus*.

1) *Sarcochilus falcatus* is a variable species, whose flowers exhibit a wide range of shapes.
2) *Sarcochilus falcatus* always has gaps to some degree between its segments.
3) Consistency of shape within an individual is important.
4) So is consistency in colouration.
5) *Sarcochilus falcatus* is capable of an impressive floral display.

Sarcochilus falcatus in Hybridization

Sarcochilus falcatus has 29 hybrid progeny. Notable hybrids with *S. falcatus* as one of the parents include the primary hybrids *Sarcochilus* Melba (*S. hartmannii* x *S. falcatus*), which itself has 29 hybrid progeny; *Sarcochilus* Melody (*S. fitzgeraldii* x *S. falcatus*), which has 18 hybrid progeny; and the secondary hybrid Judith (*S.*

Fitzhart x *S. falcatus*), which has 21 hybrid progeny. These three hybrids have given rise to the major lines by which *S. falcatus* hybrids have been continued in breeding programs. Those breeding programs have increased the influence of species that introduce flower colour and amenability to pot culture at the expense of *S. falcatus*, due to repeated crossing with other species and complex hybrids dominated by *S. hartmannii*. Recently awarded plants with *Sarcochilus* Melba in their background (Table 1) all have an eighth or less *S. falcatus*, except for *S.* Olive Nymph and *S.* George Colthup, both of which have 25% *S. falcatus* in their background, though nothing in the awarded clone of *S.* George Colthup suggests it has *S. falcatus* in its ancestry, and even the labellum shape is all *S. hartmannii*.

An interesting exception among awarded *Sarcochilus* is *S.* You Beauty 'Dellys' HCC/ANOS 2019 (NSW), which is a complex hybrid crossed with *Sarcochilus falcatus*, expressing a highly desirable combination of an even pink base colour overlain by more or less equally sized spots. Similar 'new' floral forms resulting from back-crossing complex hybrids to species with white flowers are seen in *Dendrobium*, involving *D. falcorostrum.* This may be due to unusual patterns of gene regulation and the expression of recessive alleles in progeny derived from crossings in which one of the parents has no pigment expression in the petals. White is not a colour as such, it is the product of diffusion and scattering of light transmitted across the many cell walls comprising the floral segment.

So far the crosses between *S. falcatus* and *S.* Bobby-Dazzler (= *S.* You Beauty, 31.3% *S. hartmannii*), *S.* Issys Rainbow (= *S.* Peppermint Spots, 37.5% *S. fitzgeraldii*) and *S.* Val (= *S.* Melody's Delight, 34.4% *S. hartmannii*) are the hybrids registered where third-generation hybrids have been crossed onto *S. falcatus*. To date, only third-generation hybrids dominated by *S. hartmannii* and *S. fitzgeraldii* have been crossed in this manner.

There may be scope to explore crosses between *S. falcatus* and third and fourth generation hybrids dominated by other species, or including reasonably high percentages of other colourful species such as *S. hirticalcar*, *S. spathulatus*, and *S. dilatatus* alongside *S. hartmannii* and *S. fitzgeraldii* in their background. The rearrangement of gene regulatory networks in combination with the generation of novel allele combinations that occurs when third and fourth generation hybrids are made means we might anticipate more novel colours and colour combinations when other complex hybrids are crossed with *S. falcatus*.

Acknowledgements

I thank the creators of and contributors to many websites, including Instagram, Australian National Botanic Gardens, and Retired Aussies, for putting images of *Sarcochilus falcatus* online for us all to enjoy, and from which I collected data on labellum shape.

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Matt Renner recently resigned his Research Scientist role at the National Herbarium of New South Wales to return to New Zealand, where he will continue to be a keen orchid grower.

Michael Coker's Approach to Culture of *Sarcochilus*

Text and Photos Michael Coker | info@boutiqueorchids.com

Summary

Sarcochilus species and hybrids are very desirable plants for a relatively small collection under a variety of conditions. In Melbourne, most plants flower without added heat in October-November. I have developed a cultural regime with a particular design of plant house. The wall panels are left off until June to initiate flowering, then returned to provide a warmer environment, to achieve the goal of maximum flowering in August, when I choose to exhibit the plants.

Introduction

Sarcochilus is a genus found in Australia and on certain Pacific islands. The name comes from the Greek words 'sarco' meaning fleshy and 'cheilos' meaning lip, with an obvious reference to the fleshy labellum on some species. The Kew Gardens website currently lists 23 species – and most of these are endemic to Australia.

Within Australia, *Sarcochilus* can be found in Queensland, New South Wales, Victoria, and Tasmania, with the general distribution from Cape York Peninsula south to Tasmania. They are either epiphytic or lithophytic and are distributed from coastal lowlands to mountainous areas and tablelands.

From a taxonomic perspective, *Sarcochilus* belong in the Tribe Vandeae and the Subtribe Aeridinae. *Sarcochilus* have long been acknowledged as being able to form intergeneric hybrids with several other well-known genera in Vandeae including *Aerides*, *Gastrochilus*, *Phalaenopsis*, *Rhynchostylis*, and *Vanda*.

My background with *Sarcochilus*

The genus *Sarcochilus* is my favourite Australian native genus. I have approximately 200 flowering size plants, and four trays of deflasked seedlings. Most of these are hybrids, but I have several species including *S. hartmannii*, *S. ceciliae*, *S. olivaceous*, and *S. falcatus*.

I have grown *Sarcochilus* throughout my time in orchids, and over that time I have refined the growing conditions, as well as becoming much more discerning in the choice of plants to keep!

Growing environment

I live in Melbourne, Victoria, therefore the plants are exposed to a wide range of temperatures. There is a need to manage low winter temperatures where cold winter nights can easily be a couple of degrees below 0° C, and summer maximum temperatures as high as 45° C. Rainfall in Melbourne is also unpredictable. All of my *Sarcochilus* grow undercover and I can control the amount of water they receive. They are grown in my second-largest greenhouse – a structure that is 7 m wide, 8 m long, and 3 m high.

The most interesting feature of this greenhouse is the construction of the walls. Each of the four sides is made up of six panels of fluted polycarbonate. This ensures a level of insulation and also permits plenty of light to enter inside. Each panel is also removable – they are each affixed by two small screws. This allows the removal of certain panels for summer and reinstallation for winter. A panel on the north side and a panel on the south side also has a hinged door so that when the panels are all installed, I can open one or both of these to allow

View of the *Sarcochilus* growing area.

a cross breeze on sunny winter days, where the temperature inside can reach 35° C.

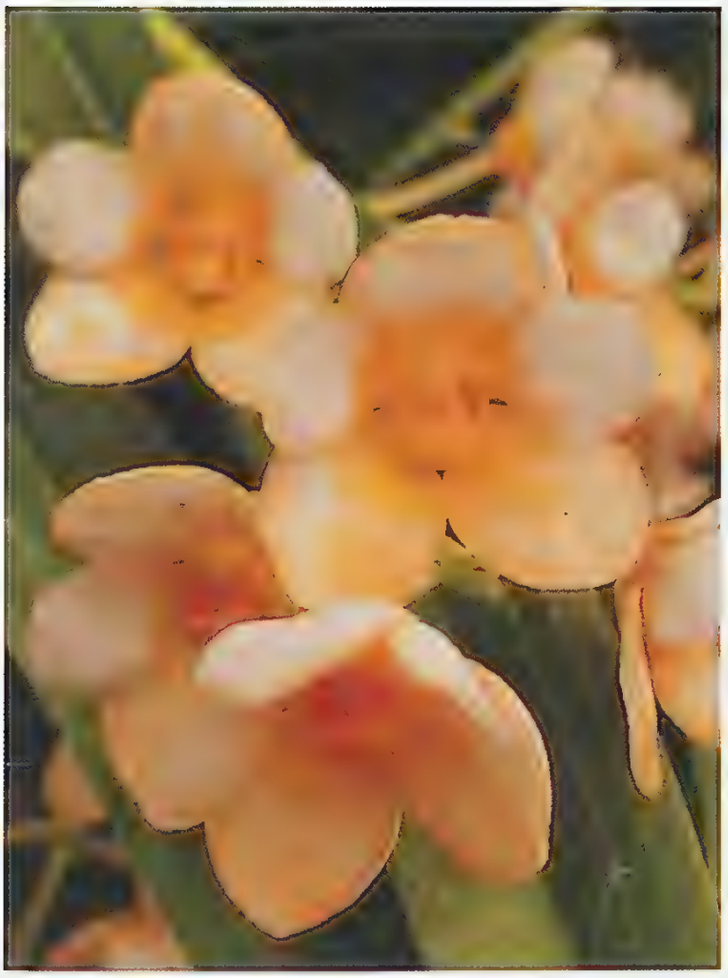
Each of the walls is lined with 50% white woven shade cloth, to provide minimal shade as well as prevent insects from entering the growing area. Each wall is lined with galvanised steel mesh of about 25 mm squares. This allows plants, including *S. ceciliae,* to be hung all around the walls.

The roof is made of fluted polycarbonate, and it has one layer of 70% white knitted shade cloth on the top and one layer of 50% white woven shade cloth suspended approximately 30 cm below the ceiling – again to provide some additional shade.

There is an overhead watering system comprised of nine small spinning jets every 2 m or so apart. I only use this watering system for regular misting in hot weather, and for applying insecticides and fungicides when required. Plants in this greenhouse are given fertiliser and ordinary water through a hand-held hose. I like to water by hand so that each plant can be regularly checked to see if any of them need special attention – for instance realigning a plant so that it doesn't overlap others or is shaded by others, staking flower stems and identifying occasional problems such as insect pests or fungal diseases.

I like to have a lot of air movement in the *Sarcochilus* greenhouse. There is a large 75 cm diameter fan under the middle bench which blows west to east. There are also two smaller circulating fans each approximately 20 cm diameter above the benches, aiming diagonally from each of the north-west and north-east corner to the south-east and south-west corners respectively.

Benches are installed at approximate waist height, filling the greenhouse most efficiently. The benches against walls are 90 cm wide, and the freestanding benches are 1.8 m wide. There is considerable hanging space to maximise the efficiency of the greenhouse.



1. *Sarcochilus* Kulnura Fair

2. *Sarcochilus* Kulnura Kaleidoscope

I originally had small electric heaters in the greenhouse for the colder months, but this proved to be extremely expensive! Later, a conventional domestic gas-ducted system was installed with the duct being a stainless-steel tube running the length of the east wall (therefore blowing against the 75 cm diameter fan on the west wall), with four vents along it. It is managed by a thermostat attached to the pole in the middle of the greenhouse and set at approximately 18° C. This has proved to be an extremely effective way of heating without exorbitant cost. The only issue with using gas is that it dries the plants more than required, so overhead misting and regular hand-watering become even more important.

Cultural regime

The greenhouse in which I keep my *Sarcochilus* also houses many other orchid genera including *Zygopetalum*, *Cymbidium*, *Lycaste*, *Masdevallia*, *Paphiopedilum*, *Prosthechea*, *Epidendrum* and *Phaius*. The variety of genera in the greenhouse presents challenges to ensure that each genus with its different cultural requirements has those requirements provided.

The most significant cultural approach that I have embraced specifically for *Sarcochilus* (despite what any other genus in that greenhouse likes!) relates to temperature control. I have found that *Sarcochilus* need a significant cold snap to initiate flower stems. This is where the removable wall panels come into their own. The panels stay off until, generally, the second week of June. They remain on until late September/early October. This ensures that the Melbourne colder nights in May and early June combine to initiate flower stems. Interestingly, in 2018 I put the wall panels back on in late April and turned the internal heating on. That year, of the 150 *Sarcochilus* I then had, only about four flowered! I really should have done my research on their cultural needs earlier, but from 2019, I put in place the new regime of putting wall panels back on in June. In 2019 every single *Sarcochilus* plant flowered, and each of them had

3. *Sarcochilus* Kulnura Momentum

4. *Sarcochilus* Kulnura Secure

5. *Sarcochilus* Kulnura Surprise

6. *Sarcochilus* Kulnura Wild

5–12 stems. That proved to be a magnificent show, and I have taken this approach ever since.

In terms of watering and fertiliser, my plants are watered three times per week all through the year, with one of those waterings being plain water without fertiliser. The other two waterings each involve the addition of either Atlantis Orchids *SuperBrew*, Wain's *Orchid Excellence* or the plant tonic *Seasol*. I use fertiliser and *Seasol* in fairly strong doses. I have never been a believer in the 'weekly weakly' fertiliser approach, nor have I ever reduced fertiliser concentration over the colder months. This regime works extremely well for me, but I suspect it might not for others, so as I always say, every individual grower needs to assess their growing conditions in a holistic sense, and not simply follow what other growers, even very successful growers, do with their orchids.

Ideally, I would like to repot each *Sarcochilus* each year, but I simply don't have enough time to do that. Instead, I have let them fill smaller pots and then placed the smaller pots into larger (generally 25 cm diameter and 15 cm depth) 'port' pots so that the roots can grow freely outside the small pot without becoming too ungainly. On the odd occasion when I do repot, I use a medium that I mix up myself comprised of three parts 6–9 mm (Classic) *Orchiata* bark, three parts 9–12 mm (Power) *Orchiata* bark, one part *Canna* hydroponic clay pebbles, and one-part coarse horticultural charcoal. For the very small plants, the slight variation on this mix is that the *Orchiata* bark used is only the 6–9 mm (Classic) grade.

Flowering Time

In most unheated collections in Melbourne suburbs, the peak flowering time for *Sarcochilus* hybrids is October to November, with *Sarcochilus* shows scheduled at that time. The results of a period of enclosing the house (effectively heating) are to advance the peak flowering time to August. I have chosen this approach to coincide with the OSCOV Spectacular, a major orchid show in late August that involves nearly all orchid societies in the region. The quality of flowers does not appear to be lessened at all. Growers who wish to exhibit flowering plants in October-November should not use the regime described above.

Favourite *Sarcochilus*

Over time I have refined the collection to focus on several features that I consider most desirable in hybrids. These include the new intensely coloured yellow/orange varieties, plants with white flowers and red/purple spots, and those of high show bench quality. The pictures that accompany this article showcase some of my favourite *Sarcochilus*.

I have always been a great fan of *Sarcochilus* species, and I don't have as many as I would like. I have found the twig epiphytes difficult to grow, so have avoided those. There is a continuing challenge to improve the growing conditions so that other species can survive.

Concluding Comments

Sarcochilus tick virtually all of the boxes for a desirable orchid. They are cool-growing, which is important in the Melbourne environment (although as I have noted I do grow with heat). They grow quickly, are hardy, some have multiple new growths, they send up multiple flower stems, and come in a variety of attractive colours and patterns.

If you don't grow *Sarcochilus* – wherever you are, you could look into the plants likely to thrive in your environment and make some purchases.

Michael Coker is an OSCOV judge, ANOS associate judge and experienced general and species grower.

Macarthur ANOS Native Orchid Survey of the Macarthur Region - November 2020 to December 2021

Text by Ross Morrison and Jim Cootes | photos by Jim Cootes macarthuranos@gmail.com

Introduction

Macarthur (and District) ANOS was established in 1990 as a group committed to the local conservation of native orchids and the cultivation of native orchid species and their hybrids. In its early years, the society was known for its terrestrial native orchid growers. Over the last decade, Macarthur ANOS has become more about growing epiphytic native species and hybrids and like all societies is struggling to attract new members. Notable past and current members include John Riley, Maurie Douglas, Ken Jackson, Harry Turner, John English, Ray Clement, Mike Harrison, Greg Steenbeeke, Richard Dimon and Jim Cootes.

In September 2020, all community groups across Macarthur were invited to apply for a Local Community Investment Program Grant from the Australian Gas Light Company (AGL). Macarthur ANOS submitted two applications: the first related to a community health initiative and membership drive for Macarthur ANOS whilst the second related to the concept of a native orchid survey across Macarthur.

Following initial discussions with the AGL Grants Coordinator, the MANOS Secretary was asked to develop a presentation for the AGL Grants Committee at its stage 2 and final decision process relating to the orchid survey – 12 community grants were to be allocated. The presentation highlighted the fact that 80% of native orchids in Macarthur were terrestrial and for at least 75% of the year these orchids were dormant, meaning developers, local councils, state government authorities and others were often making decisions without full species knowledge thus impacting native vegetation areas.

In October 2020, Macarthur ANOS were advised of their successful grant application, which was $2,300 to be used to fund travel / catering and production of an information brochure, for use at local council information centres and aligned groups. In developing the concept, Macarthur ANOS understood the use of community members – naturalists, bushwalking groups, Landcare groups would not only greatly assist the surveys outcomes but also encourage awareness of orchids and Macarthur ANOS.

The Macarthur Region is south-west of Sydney and has an area of 3000 km^2 (Fig. 1) and encompasses the local council areas of Liverpool, Campbelltown, Camden and Wollondilly. It has vast areas of land with restricted access, including Nattai National Park, Cataract (both Water Management lands) and Holsworthy Army Reserve. The total area of these lands occupies almost 50% of the region, and unfortunately no access was permitted during this survey. Rapid industrial, housing and transport development is happening across the Macarthur Region and orchid populations are being impacted by human intervention both directly with land clearing, trailbike damage, etc and indirectly with water runoff diversions and weed invasion.

The main vegetative habitats found across Macarthur include dry sclerophyll forests and grasslands (Cumberland Plain woodlands), wet sclerophyll forests and small rainforest sections

Caladenia carnea

Caladenia catenata

Caladenia fuscata

Caladenia major

Calochilus campestris

Chiloglotis formicifera

Chiloglottis trapeziformis

Corybas fimbriata

Dipodium variegatum

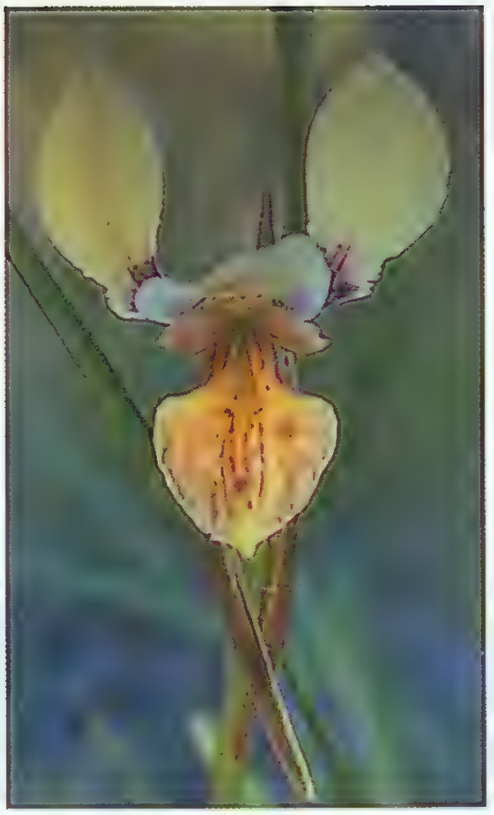
found in some gorges of the Georges and Nepean Rivers. However, throughout the application process, the survey, and its various press releases, it was highlighted that terrestrial orchids occur in any natural vegetation site – transport verges, industrial vacant lands, small council reserves.

Travel restrictions associated with COVID 19 meant that many searches in isolated or distant parts of Macarthur were unable to happen at optimal orchid flowering times of August, September, October, November 2021.

Methods

A previous survey undertaken by Ken Jackson and John Riley in 1995 highlighted 77 orchid species occurring across the Macarthur region – 65 terrestrials and 12 epiphytes / lithophytes. The 2021 survey utilised print and digital local media outlets to promote the project and sought public assistance in identifying occurrences of orchids

Diuris sulphurea



Diuris × nebulosa

Eriochilus petricola

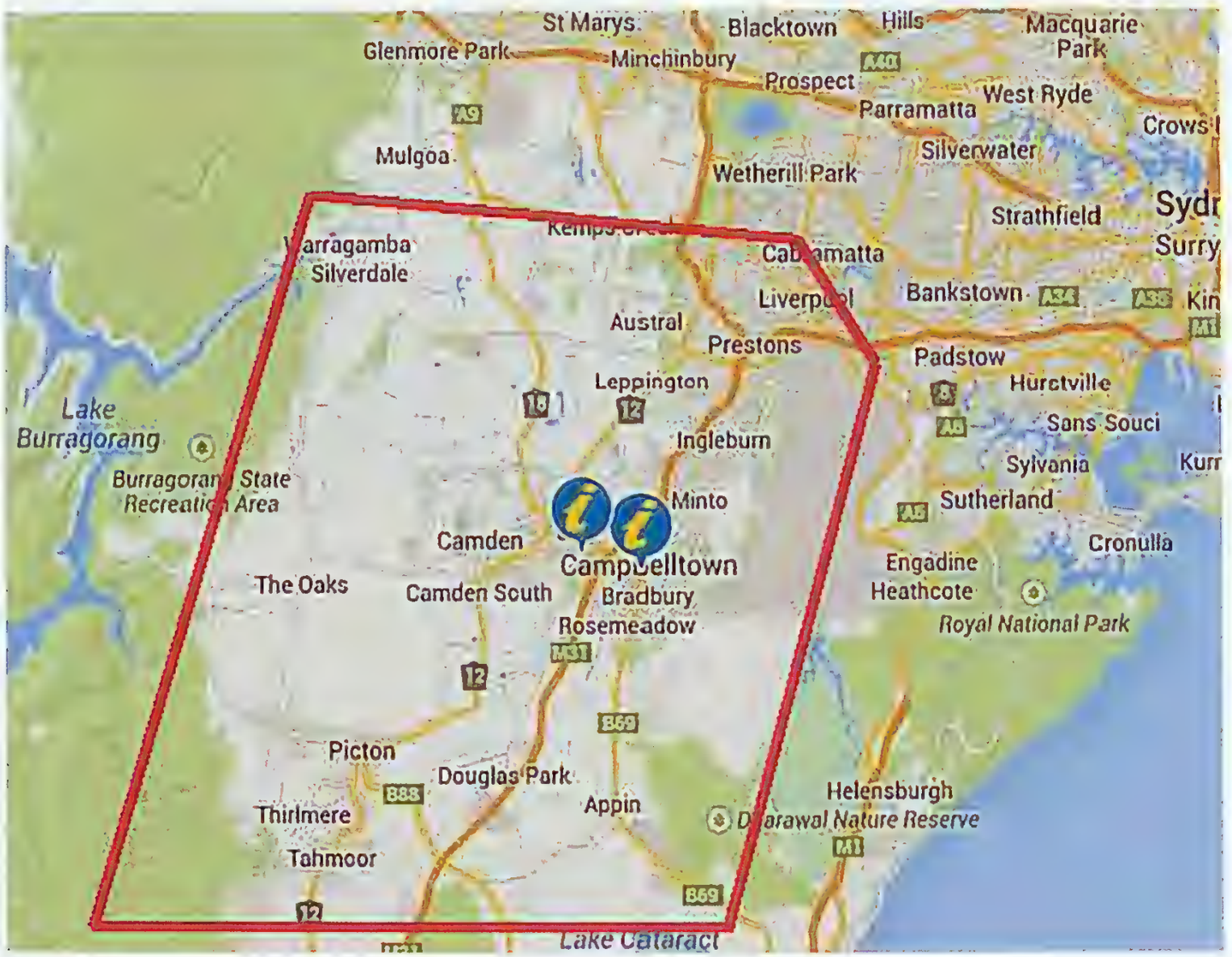


Figure 1. Map of Macarthur region.

across the region. Press releases were supplied to local media outlets to report progress and further gain community support.

The collection of orchid observation data utilised a variety of methods:

- the emailing of photographs to macarthuranos@gmail.com
- posting of photographs on the Macarthur ANOS Group Facebook Page
- posting of photographs in the iNaturalist App online. A project within the App titled *Macarthur Region Orchid Search* isolated all observations across the region.

Results

The 2020-21 survey achieved several successes including:

- Over 75 community naturalists and members of Macarthur ANOS provided orchid observations
- Over 890 orchid observations were received
  - Over 850 orchid observations have been logged into the iNaturalist project
  - Over 50 orchid observations were emailed
  - Over 50 orchid observations were uploaded to the Macarthur ANOS Group Facebook Page
- 89 orchid species were observed
- 22 orchid species not previously known to occur in the Macarthur region have been observed up to December 2021
- 21 previously observed orchid species were not seen up to December 2021
- Increased community awareness of Australian orchids through local media – various press release published.
- Five new Macarthur ANOS members

Cryptostylis hunteriana

Lyperanthus suaveolens

Table 1. Terrestrial orchid species observed in the 2021 Macarthur region survey.

Species	Occurrence	Location
Acianthus exsertus	Uncommon across limited sites	6,7,8
Acianthus fornicatus	Common / abundant across multiple sites	1,2,3,6,7,8,9,10,11,12, 13,14,15,17,19,20,22
(*Acianthus pusillus*)*	Uncommon across limited sites	22
Caladenia alata	Uncommon across limited sites	13,19
Caladenia caerulea	Uncommon across limited sites	5,8,9
Caladenia carnea	Common across multiple sites	6,7,8,9,11,17,20
Caladenia catenata	Common / abundant across multiple sites	2,3,6,7,8,9,10,11,12,13,17, 19,20
Caladenia curtisepala	Uncommon across limited sites	6,7,8
Caladenia gracilis	Rare at limited sites	13
Caladenia fuscata	Common across multiple sites	6,7,8,9,12,17
Caladenia picta	Uncommon across limited sites	3
Caladenia testacea	Uncommon across limited sites	13,14,15,17,19
Caleana major	Common across multiple sites	6,7,9,13,17
Caleana minor	Rare at limited sites	13
Calochilus campestris	Common across multiple sites	1,2,3,6,7,8,9,13,17,19
Calochilus gracillimus	Uncommon across limited sites	2,3,6,7,8,9
Calochilus paludosus	Common / abundant across multiple sites	1,2,3,4,6,7,8,9,1011,12, 13,14,17,19
Calochilus robertsonii	Common / abundant across multiple sites	1,2,3,4,6,7,8,9,1011,12,13, 14,17,18,19
Chiloglottis diphylla	Common / abundant across multiple sites	6,7,8,9,10,11,12,13,17
Chiloglottis formicifera	Uncommon across limited sites	6
Chiloglottis seminuda	Common / abundant across limited sites	7,8,9
Chiloglottis trapeziformis	Uncommon across limited sites	9
Corybas aconitiflorus	Common across multiple sites	7,8,9,13,22
Corybas fimbriatus	Common across limited sites	7,8,9,17,20
Corybas unguiculatus	Uncommon across limited sites	13
Cryptostylis erecta	Uncommon across limited sites	13
Cryptostylis hunteriana	Uncommon across limited sites	9
Cryptostylis leptochila	Uncommon across limited sites	13
Cryptostylis subulata	Uncommon across limited sites	7,9,13,17,19
Cyrtostylis reniformis	Uncommon across limited sites	8,9,13
Dipodium punctatum	Common across multiple sites	2,3,8,9,10,11,12,13,17,19
Dipodium roseum	Uncommon across limited sites	9,17
Dipodium variegatum	Common across multiple sites	1,2,3,6,7,8,9,11,12,17,19
Diuris aurea	Common across multiple sites	3,4,6,7,9,11,17,19
Diuris maculata	Common / abundant across limited sites	2,3,4,6,7,8,9,10,11,12 13,17,19
Diuris punctata	Uncommon across limited sites	3,19
Diuris sulphurea	Common across multiple sites	2,3,4,5,6,7,8,9,10,11,12,13 ,1718,19
Diuris x nebulosa	Rare at limited sites	19
Eriochilus petricola aff. Eriochilus autumnalis	Rare at limited sites	12
Eriochilus cucullatus	Rare at limited sites	2,3
Erythrorchis cassythoides	Uncommon across multiple sites	9,10,11
Gastrodia sesamoides	Uncommon across limited sites	9
Genoplesium baueri	Rare at limited sites #(OEH Classification – Endangered)	13
Genoplesium filiforme	Uncommon across multiple sites	2,3,4,6,12,13,19

Genoplesium fimbriatum	Uncommon across multiple sites	9,12,13
Genoplesium pumilum	Rare at limited sites	13
Genoplesium rufum	Rare at limited sites	2,3,13
Glossodia minor	Common across multiple sites	2,3,4,6,7,8,9,10,11,12,13
Glossodia major	Common across multiple sites	6,7,8,9,10,12,13
Lyperanthus suaveolens	Common across multiple sites	2,3,4,6,7,8,9,10,11,12,13
Microtis oblonga	Rare at limited sites	2,3
Microtis unifolia	Common across multiple sites	2,3,4,6,7,12,13
Microtis parviflora	Uncommon across limited sites	6,12
Orthoceras strictum	Uncommon across limited sites	9,12,13
Prasophyllum australe	Uncommon across limited sites	14
Prasophyllum elatum	Uncommon across limited sites	2,3,4,12
Prasophyllum flavum	Uncommon across limited sites	14,19
Prasophyllum fuscum	Rare at limited sites - #(OEH Classification - Critically endangered)	16
Pterostylis acuminata	Common across multiple sites	2,3,4,5,6,7,8,9,11,12,13,17 ,18,19,20,21,22,23
Pterostylis antennifera	Rare at limited sites	9
Pterostylis concinna	Common / abundant across multiple sites	1,2,3,4,6,7,8,9,10,11, 12,13,14,17,20,22
Pterostylis curta	Uncommon across limited sites	6,7
Pterostylis daintreana	Uncommon across limited sites	13,14
Pterostylis erecta	Common across limited sites	6,7,9,11
Pterostylis grandiflora	Uncommon across limited sites	9
Pterostylis hispidula	Uncommon across limited sites	6,7
Pterostylis longifolia	Common / abundant across multiple sites	2,3,4,6,7,8,9,10,11,12, 13,17,19,20,21,22,23
Pterostylis nutans	Common / abundant across multiple sites	2,3,4,6,7,8,9,10,11,12, 13,17,19,20,21,22,23
Pterostylis rufa	Rare at limited sites	15
Pterostylis saxicola	Rare at limited sites #(OEH Classification - Endangered)	6,7
Pterostylis uliginosa	Rare at limited sites	13
Spiranthes australis	Uncommon across limited sites	13,14
Thelymitra brevifolia	Uncommon across limited sites	2,8,9
Thelymitra carnea	Common across limited sites	2,3,9
Thelymitra cyanea	Uncommon across limited sites	14
Thelymitra ixioides	Common across multiple sites	2,3,4,7.8.9,11,12, 13,17,19,22
Thelymitra nuda	Uncommon across limited sites	13
Thelymitra pauciflora	Common across multiple sites	1,2,3,4,6,7,8,9,17,18
Thelymitra peniculata	Common across multiple sites	1,2,3,4,6,7,8,9

**Acianthus pusillus* is regarded as a synonym of *Acianthus exsertus* by the World Checklist of Selected Plant Families (WCSPF).

Office of Environment and Heritage, New South Wales

Legend for Locations

1 Moorebank; 2 Holsworth; 3 Voyager Point; 4 Heathcote Road; 5 Hoxton Park; 6 Macquarie Fields; 7 Ingleburn; 8 Minto Heights; 9 Kentlyn; 10 Airs; 11 St. Helens Park; 12 Wedderburn; 13 Appin; 14 Cataract; 15 Douglas Park; 16 Wilton; 17 Thirlmere; 18 Couridjah; 19 Bargo; 20 Nattai; 21 The Oaks; 22 Silverdale; 23 Warragamba.

Highlighted orchids were recorded in 2021 but not 1995.

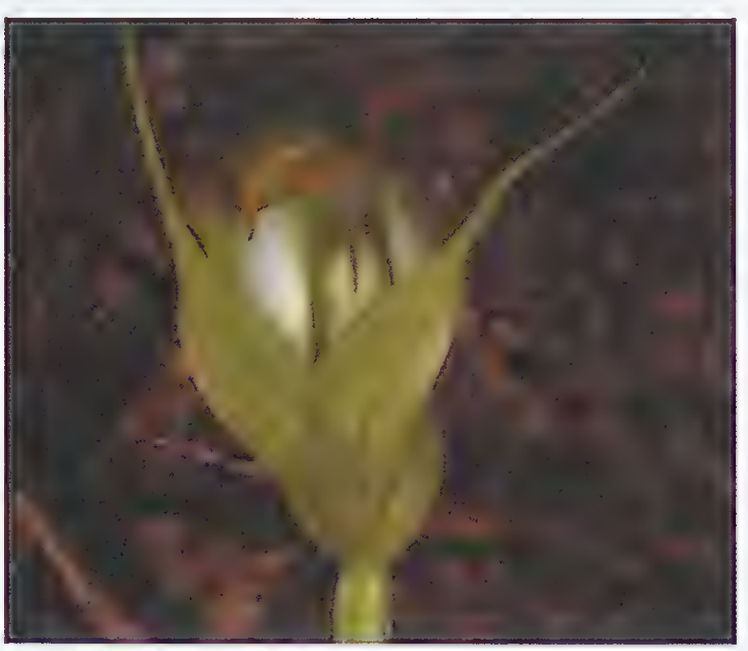
Table 2. Epipytic and lithophytic orchid species observed in the 2021 Macarthur region survey.

Bulbophyllum exiguum	Uncommon across limited sites	11,12
Cymbidium suave	Uncommon across limited sites	6,11,20,23
Dendrobium linguiforme	Common across multiple sites	3,6,7,8,9,10,11,12,13,14, 15,17,23
Dendrobium pugioniforme	Uncommon across limited sites	17
Dendrobium speciosum	Uncommon across limited sites	8,9,12,17,20,23
Dendrobium striolatum	Uncommon across limited sites	10,11,12,13,17
Liparis reflexa	Common across multiple sites	6,7,8,9,10,11,12,13,17,19
Plectorrhiza tridentata	Uncommon across limited sites	7,8,9,10,11
Sarcochilus australis	Rare at limited sites	12
Sarcochilus hillii	Uncommon across limited sites	7,8,11,12

Table 3. Orchid species reported in the Macarthur region in 1995 but not located in the 2021 survey.

Acianthus caudatus (Mayfly Orchid)	*Gastrodia procera*	*Pterostylis brinsleyi* (Pleasure Point Rustyhood)
Corybas fordhamii (Banded Helmet Orchid)	*Genoplesium densa* (Dense Midge Orchid)	*Pterostylis longipetala* (Curved Greenhood)
Corybas hispidus (Bristly Helmet Orchid)	*Prasophyllum nublingii* (syn. *Genoplesium nublingii*)	*Pterostylis obtusa* (syn. *Diplodium obtusa)*
Corybas pruinosus (Toothed Helmet Orchid)	*Genoplesium nudiscapum*	*Pterostylis ophioglossa* (Snake Tongue Greenhood)
Dendrobium aemulum (White Feather Orchid)	*Genoplesium sagittiferum*	*Pterostylis parviflora* (Tiny Greenhood)
Dendrobium cucumerinum (Cucumber Orchid)	*Prasophyllum brevilabre* (Short Lipped Leek Orchid)	*Pterostylis reflexa* (Late Autumn Greenhood)
Diuris aequalis (Buttercup Donkey Orchid)	*Pterostylis bicolor* (Black-Tip Greenhood)	*Pterostylis truncata* (Brittle Greenhood)

Plectorrhiza tridentata



Pterostylis acuminata

Thelymitra carnea

Thelymitra ixioides

Tables 1 and 2 list the terrestrial, epiphytic and lithophytic orchid species recorded in 2021 and their localities. Table 3 lists orchids observed in the 1995 survey that were not seen in the 2021 survey period. Due to the nature of habitats across the region and restricted areas it is highly likely the following species are present but yet to be observed – *Pterostylis hildae, Rimacola elliptica, Plectorrhiza beckleri,* and *Pyrorchis nigricans.*

Followup

Macarthur ANOS has decided to keep the project running within the iNaturalist App, which will allow future observations to be recorded. Concern often exists in relating exact locations in survey data and for this reason only suburb locations are provided. Macarthur ANOS members are happy to provide further advice on locations to appropriate persons as needed. An A5 four-page brochure and a digital presentation have been delayed while further areas across the Macarthur region are be searched.

Annual updates will be provided to ANOS Inc. and new observations will be highlighted on the Macarthur ANOS Group Facebook page.

Acknowledgements

A big thank you to the over 75 community members you have provided orchid observations as part of this survey. A special thank you to Mat Misdale, Bushland and Biodiversity Officer, Campbelltown City Council, for his support during the survey.

Note:

iNaturalist is a joint project initiated by the California Academy of Sciences and the National Geographic Society. The App can be installed on both android and apple devices. Further information can be found at inaturalist.org.

Ross Morrison is a retired schoolteacher and current Macarthur ANOS Secretary. Jim Cootes specialises in the orchids of the Philippines. He is also the author of three books (one co-authored) and has contributed countless articles to orchid magazines and journals worldwide.

Between a Rock and a Hard Place – Terrestrial Orchids growing as 'Lithophytes' in Western Australia

Text and photos Harry Ashton | harry.ashton@live.com.au

Summary

Several species of terrestrial orchids growing on rocks in southwestern Western Australia have been identified and photographed. They can adapt to unexpected habitats if the microclimate is suitable.

Introduction

Orchid enthusiasts in Western Australia live in constant envy of the eastern states and have good reason to be - their rainforests and mountain ranges are dripping with epiphytes. Except for *Cymbidium canaliculatum* R.Br. and *Dendrobium affine* (Decne.) Steud., which are native to our northern tropics, orchids cannot survive as epiphytes here. Perth summers are characterized by blistering heat and painfully low humidity, with months without rain. There is no pseudobulb large enough to support plants through these harsh conditions.

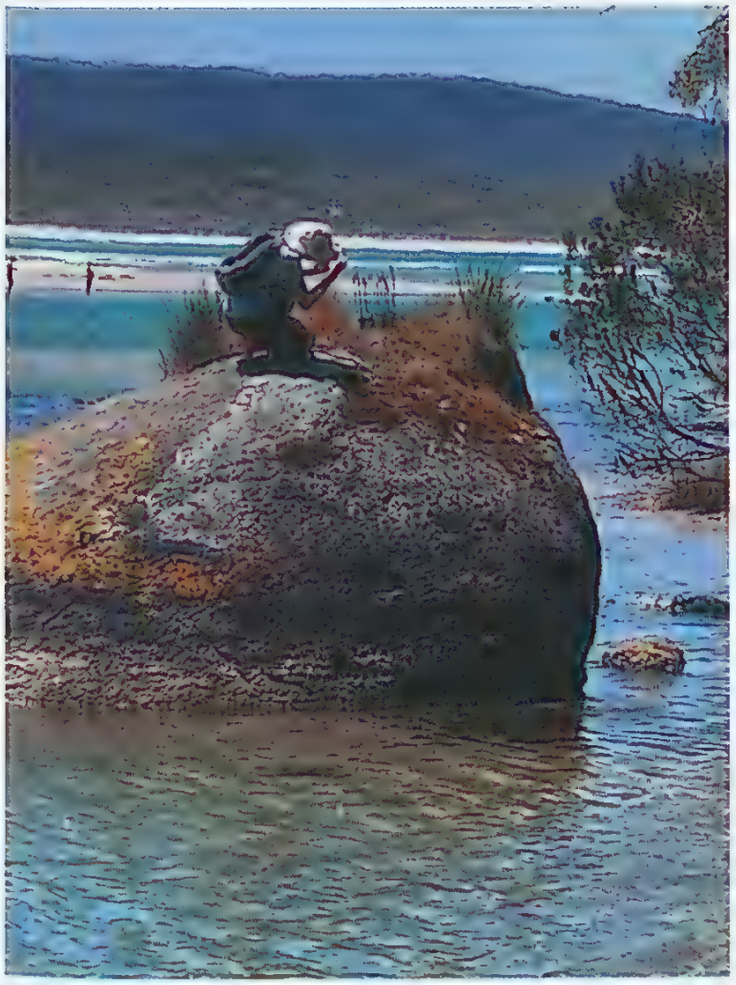
We do have orchids though and are very proud of our terrestrials, which have adapted to our climate. They hide dormant underground through summer and only come to life and flower in response to the rains experienced throughout our cool, wet winters. Our terrestrial orchids, despite being difficult if not impossible to cultivate, are magnificent. While I am no expert, I hope to share some interesting pictorial examples of Western Australian orchids defying the odds and surviving not underground, but in specialised microclimates on exposed rock faces.

Terrestrial Species Located Growing on Rocks

The scented sun orchid, *Thelymitra macrophylla* Lindl. is a common endemic species in southwestern Western Australia, usually found growing as a terrestrial. It is perhaps the easiest to spot, with tall inflorescences that can reach up to one meter tall and carry over 20 fragrant flowers. I photographed a specimen plant growing on a salt-crusted boulder surrounded by ocean off the southern coast. Despite not even reaching summer, the foliage had already been burned to a crisp by late October. This does raise questions around correct identification given there are a number of similar blue *Thelymitra* species, several of which are most easily distinguished by the characteristics of their basal leaf. (Figs.1,2,3).

Another common endemic species in southwest Western Australia is the purple enamel orchid, *Caladenia brunonis* (Endl.) Reichb.f., which is easily recognized by its glossy sheen. It has a single flattened, hairy leaf and up to three flowers, and blooms in the peak of our terrestrial flowering season in late September and early October. It usually grows as a terrestrial, but I photographed a large granite outcrop that hosted a group of flowering plants growing along the partly shadier border, where the exposed rock face had moss growing on it (Fig. 4).

The lemon-scented sun orchid, *Thelymitra antennifera* (Lindl.) Hook.f. and the twisted sun orchid, *Thelymitra flexuosa* Endl., (Figs. 5,6) are

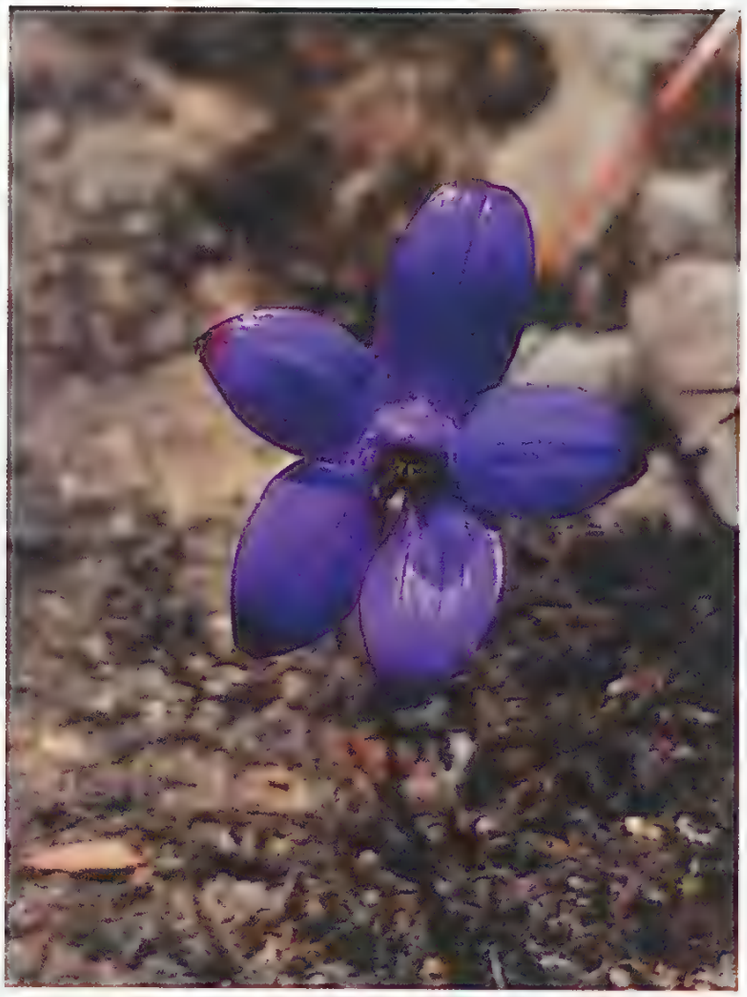


1. *Thelymitra macrophylla* growing on a rock surrounded by sea water.

2. *Thelymitra macrophylla* on rock.

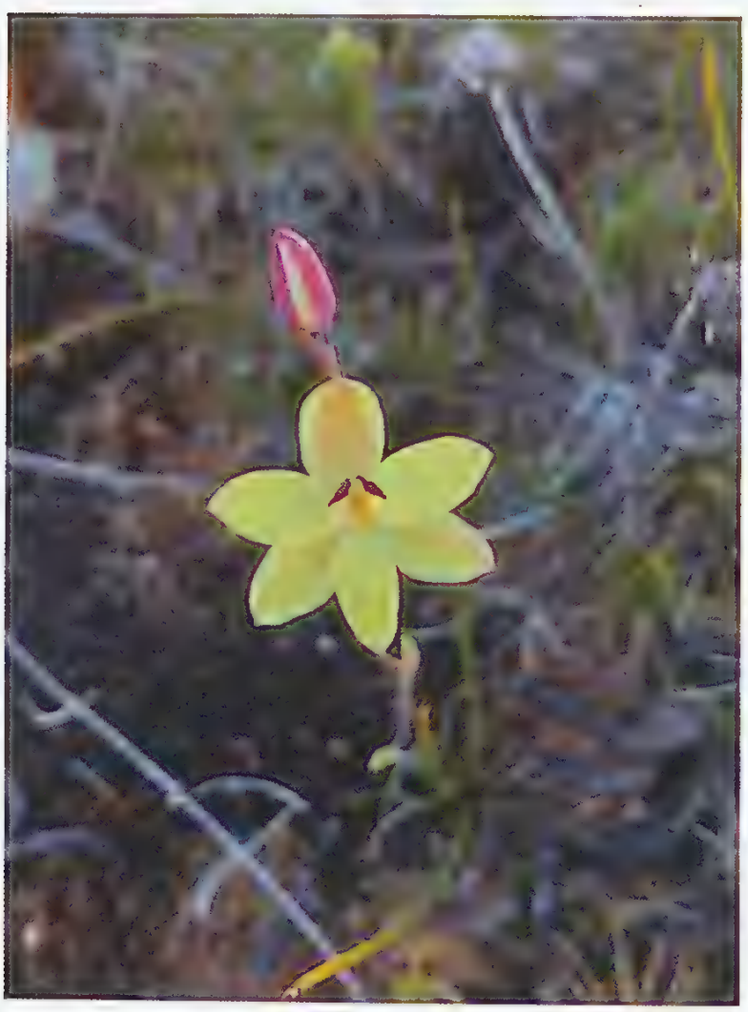
3. *Thelymitra macrophylla* on rock.

4. *Thelymitra macrophylla* base of colony.



5. *Caladenia brunonis* growing on a large granite outcrop.

6. *Thelymitra antennifera* growing on granite outcrop.



7. *Thelymitra flexuosa* growing on granite outcrop.

8. *Thelymitra magnifica.*

superficially similar species, both featuring bright yellow flowers and growing in wet, swampy regions across southern Australia. *Thelymitra antinnifera* has larger, showier flowers, with a distinctive 'bunny ear'- They were photographed growing on rocky outcrops, growing in areas where the rockface wept sufficient moisture to support the growth of mosses. The plants were flowering in spring as the mosses were beginning to dry. Both of these species are known to form natural hybrids with blue sun orchids in the *macrophylla* group, which result in unexpectedly striking pink progeny.

Harry Ashton is the secretary of the Orchid Society of Western Australia and is a member of the ANOS WA Committee and ANOS Inc Council. Harry grows a variety of orchids in Perth and has a special interest in promoting the conservation and cultivation of orchid species.

Australasian Native Orchid Society website:
www.anos.org.au

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ANOS Western Australia Report 2019–21

Text Andrea Francioli and Harry Ashton | Photos Andrea Francioli | andrearf70@hotmail.com

2019 was a year of renewal and loss for ANOS WA. Many long-term members sadly either left us, stood down from committee positions or were unable to continue attending our meetings. However, our committee members had already sown the seeds for renewal: our secretary Lyn Morgan successfully applied for a government grant, used to purchase a projector and screen, and Norm Stockton agreed to supervise a remote judging course in collaboration with Gerry Smee of ANOS New South Wales. This was the first time in at least a decade that an ANOS judging course had been offered in Western Australia.

Norm spent considerable time condensing his extensive knowledge and experience into slide presentations on various groups of Australian orchids for use at club meetings. He was also able to secure Prof. Kingsley Dickson, well known for his research on Western Australian terrestrial orchids, as a speaker at our July 2019 meeting. This was a very pleasant evening, with an extremely informative and accessible talk. There were a significant number of visitors from other orchid societies and a successful auction.

Our president Lorraine de Leuw's extensive collection was donated to ANOS WA after she sadly passed away in June 2019, and Norm took good care of the plants while striving to find good homes for them through sales and auctions. The result was that ANOS WA now has more money in the bank than it has had for many years. ANOS WA's attendance at shows continued to be significant in this difficult year, mainly thanks to Norm's contributions to the displays and Lyn's organizational skills.

We attended the South-Eastern show, the Spring Orchid Fair and the Late Flowering Show (for the first time) and significant profits were made from each of these events, from sales of club seedlings and Lorraine's plants, and also by taking part in profit-sharing schemes. Some new members were recruited (including three of our current Committee members) and the word started getting around other orchid clubs.

The COVID-19 pandemic had very little impact on us as a society, even though we had to cancel our meetings between March and May 2020. We continued working on refreshing the society. At our meetings, we have tried to place more emphasis on plant discussions, talks, demonstrations and show and tell sessions, as opposed to business, as this is what the members have said they want. Two new members, Karl Lee and Harry Ashton, have put considerable time and creativity into developing a new logo, and badge and shirt designs. They also printed 20 different Western Australian terrestrial orchid greeting cards from their own photographs taken in the bush, which have proved very popular at shows.

We participated in three shows in 2020. The South-Eastern show in Cannington saw us mount a huge display of plants supplied by Norm. These attracted a lot of interest and several new memberships. This was followed by our display at the Spring Orchid Fair, this time with plants from our new member Zel, and Norm. Norm also presented a talk during the fair. Again, we had a lot of interest and new memberships. At the end of the year, we participated in a joint display at the Late Flowering Show, which we share with the Cymbidium Society and Orchid Society of Western Australia, and again we recruited new members.

ANOS WA Group display at Intersocietal Display and Workshop

ANOS WA Group display at Perth Orchid Fair

ANOS WA Group display at Southeastern Orchid Society Show

We had a well-attended excursion to King's Park in September 2020 and have since tried to organize a few more to bush locations in 2021, but with limited interest from members so far. We placed orders for club seedlings and flasks in 2021 for sale at meetings and shows. Some of our members with large collections have very kindly donated large numbers of plants and divisions from their collections for raffles and auctions at our monthly meetings.

Norm Stockton and Karl Lee have presented interesting and well-illustrated talks at our meetings, covering *Thelymitra*, *Dendrobium*, *Liparis*, *Cymbidium*, *Bulbophyllum* and *Sarcochilus*. Norm Stockton has provided various demonstrations on the pollination of *Cymbidium* and *Dendrobium*. Courtney Rogasch has done a few demonstrations on the division and repotting of large plants. Dr Darryl Hardie, an entomologist from the Department of Agriculture, gave a talk on pests and treatments (including biological/ organic) in February 2022.

In 2021 we took part in three shows: the Intersociety Display and Workshop, the Perth Orchid Fair and the Late Flowering Show. We again received very strong positive feedback from the general public and members of other Western Australian orchid societies, and some new members were recruited. *The Orchadian* and ANOS Inc. membership were promoted at these shows, as well as membership of ANOS WA. Past copies of *The Orchadian* were on display and attracted significant interest from visitors. Membership forms were also on offer.

In 2019–21 we presented awards to four outstanding figures in the Western Australian orchid community. An Honorary Membership was presented to Prof. Kingsley Dixon, a world-renowned researcher on Western Australian terrestrials who is well-known for his extremely entertaining and informative talks. A Life Membership was presented to Ian Duncan, one of ANOS WA's founding members and an outstanding grower for many years. An Honorary Membership s presented to Graham Bowden, another well-

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known expert on Western Australian terrestrials, who is much loved by the orchid community for his approachability and willingness to share his huge knowledge and experience hunting for orchids in the bush. Honorary membership was also presented to David Edmonds, the owner of Orchidup Nursery in Walpole in the southwest and a regular and very popular seller at our shows in Perth.

In 2019–21 we have welcomed 16 new members, albeit sadly losing seven members, so we are now looking quite healthy after dropping down to very low numbers only a few years ago. Our monthly meetings have continued throughout the COVID pandemic (except between March and May 2020) thanks to the lack of community transmission. The number of members and visitors attending has also grown significantly since 2019, usually more than 10 at recent meetings and reaching 15 at our October 2021 meeting. We are in a strong financial position thanks to our shares in show profits, proceeds from auctions and sales of plants donated by members (including Lorraine de Leuw's whole collection in 2019) and margins on club plants and merchandise.

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Sarcochilus falcatus flowering plant, Border Ranges, New South Wales.. Photo Matt A.M. Renner